### TREATISE

ON

# THE MARINE BOILERS

OF THE

### UNITED STATES.

BY B. H. BARTOL,

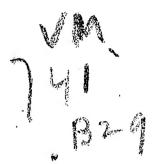
ENGINEER.

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1851.

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#### TO THE

## ENGINEERS OF THE UNITED STATES,

#### THIS VOLUME,

PREPARED FROM AUTHENTIC DRAWINGS,

AND

INFORMATION FURNISHED BY THEIR KINDNESS,

Is Respectfully Dedicated

BY THE AUTHOR.

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#### ERRATA.

- Page 2, line 16 Dip of Wheel, for 5 ft. read 6 ft.
  - " 12, " 8 Draft of Water, forward, for 15 ft. read 15 ft. 6 in.
  - " 12, " 10 Area of Cylinders, for  $17\frac{3}{4}$  read  $17\frac{1}{3}$ .
  - " 24, " 1 For "running from New York to Liverpool," read "sold to Prussian Navy."
  - " 85, After word "Flues" read "as those of the North America," &c.
  - " 120, line 13 Length of Paddles, for 9 ft. 8 in. read 9 ft. 3 in.
  - " " 16 Average Dip of Wheel, for 3 ft. 10 in. read 3 ft. 1 in.
  - " " 26 Area of Chimnies, for 39 9-10ths sqr. ft. read 33 sqr. ft.
  - " " 27 Height of Chimnies, for 75 ft. read 65 ft.
  - " 142, " 7 from the bottom, for "our furnaces are" read "each furnace is."
  - " 143. " 6 from bottom, for "differs" read "differ," and for "agrees" read "agree."

The following information has been received since the work was put to press:

#### TRIAL TRIP OF THE GOLDEN GATE.

Average number of Revolutions per minute,	$15\frac{1}{4}$
Pressure of Steam,	$8\frac{1}{2}$ lbs.
" point of Cutting off,	3 feet.
Consumption of Bituminous Coal per hour,	3472 lbs.
Water Evaporated by 1 lb. of Coal,	$7_{\frac{7}{100}}$ lbs.
Coal per hour to a square foot of Grate,	$9_{\frac{4}{100}}^{6}$ lbs.

#### TRIAL TRIP OF BUCK EYE STATE.

Average number of Revolutions per minute,	-9	16
"Pressure of Steam,	20	40 lbs.
Consumption of Bituminous Coal per hour,		3158 lbs.
Water Evaporated by 1 lb. of Coal,		$6\frac{18}{100}$ lbs.
Coal per hour to a square foot of Grate,		20 lbs.

The tubes in these boilers are 3 inches bore, and 15 feet long, and the natural draft is sufficient to give ample steam.

#### STEAMER BALTIMORE.

Average number of Revolutions per minute,	19
" Pressure of Steam,	30 lbs.
" point of Cutting off;	5 ft. 6 in.
Consumption of Virginia Pine wood per hour, 1\frac{1}{3} cords	3200 lbs.
Water Evaporated by 1 lb. of Wood,	$4_{\frac{3}{1}\frac{6}{0}0}$

The Steamer Illinois, just finished at New York, is of the same size as the Golden Gate, and her Engines and Boilers, (constructed by the Allaire Works,) are of the same kind and dimensions.

#### A TREATISE

ON THE

### MARINE BOILERS OF THE UNITED STATES.

The Fire Surfaces are all calculated from the top of the grate to the water line, which is taken at 12 inches above the flues.

All the boilers are drawn to a scale of  $\frac{3}{16}$  of an inch to the foot. See scale on last page.

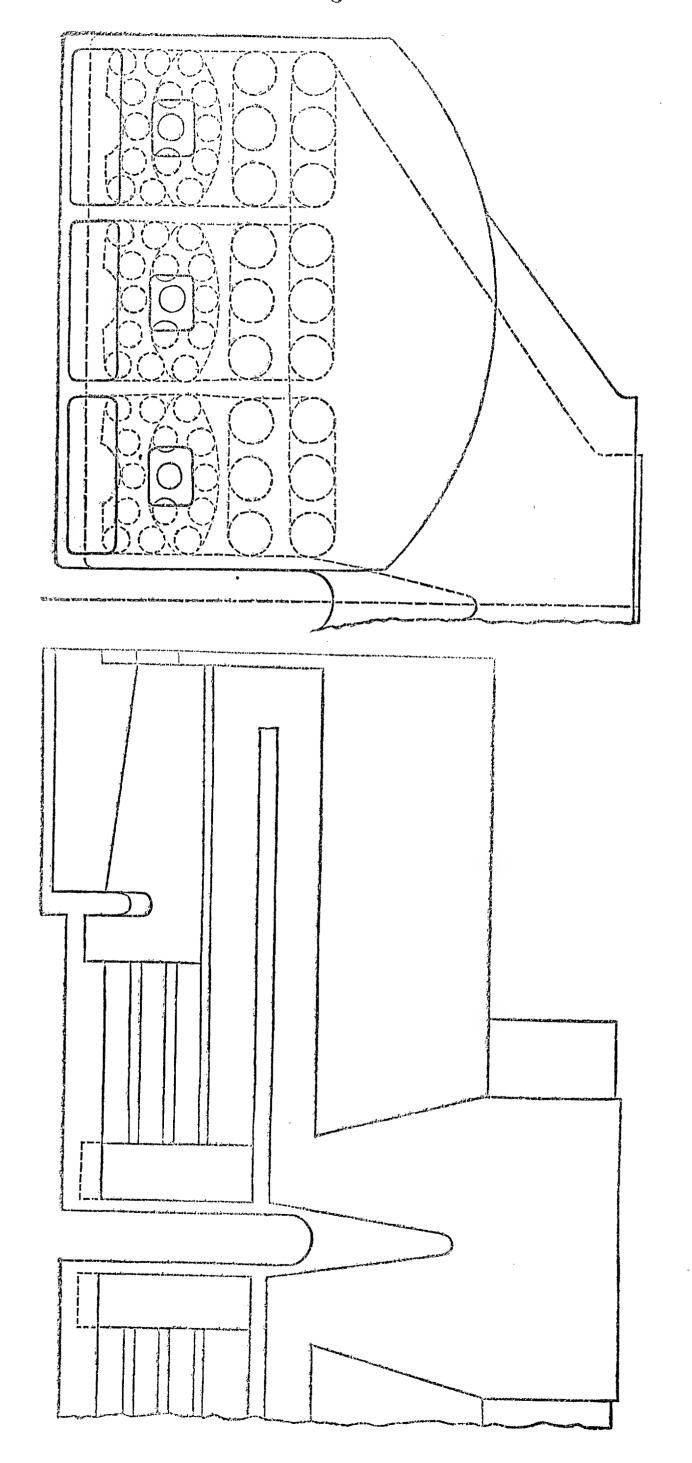
Unless noted otherwise, the draft is natural.

#### SUSQUEHANNA.

War Steamer belonging to the United States Navy. Engines and boilers designed by Charles W. Copeland, Esq., and constructed by Murry & Hazlehurst, of Baltimore.

			Feet.	Inches
Length on Deck,	ø,		256	6
Breadth of Beam, .		a.	45	0
Depth of Hold,	đ		26	6
Tonnage,		tons 2436	3	·
Average Draft of Water,	ø		18	6
Two Inclined Engines.				
Diameter of Cylinders,	ď		5	10
Length of Stroke,		3	10	$\mathbf{O}$
Diameter of Paddle Wheels,	σ		31	2
Length of Paddles, .	3	نو	9	. 6
Depth of "17 inches eac	ch, or .		2	10
Number of Double Paddles in ea	ch Wheel,	, 2	6	
Dip of Wheel, .		ď	5	0
Average Number of Revolutions,	• • • • • • • • • • • • • • • • • • •	1	2	
Average Pressure of Steam, .		lbs. 1	0	`
Cutting off at .	•		6	0
Four Copper Boilers (back to back	ck).			
Whole amount of Fire Surface,		865	2 squar	e feet.
"Grate".		34	2	6,6
Ratio of Fire Surface to cubic for	ot of Cyline	der, 1	$.6\frac{1}{4} \text{ to } 1$	o'
" Grate S	urface,	<i>C A</i>	25 to 1	. •
Area of 1st Flues, .	C3-	. 8	2 squar	e feet.
" 2d and 3d Flues, each	ø	E	2	66
" Chimney, .		. 5	4	66
Height of "above Grate,	ø	6	5 feet.	
Consumption of Bituminous Coal	per hour,	327	O lbs.	
Water Evaporated by 1 lb. of Co	oal,		$8_{\frac{4}{10}}$ lb	$S_{\sigma}$
Coal per hour to a square foot of	Grate,		$9\frac{1}{2}$ "	

Note.—The above result was obtained on her first run from Philadel-phia to Norfolk. The steam chimney is attached to the boilers, and the steam from each admitted by a regulating valve, so arranged that one or more may be used at pleasure.

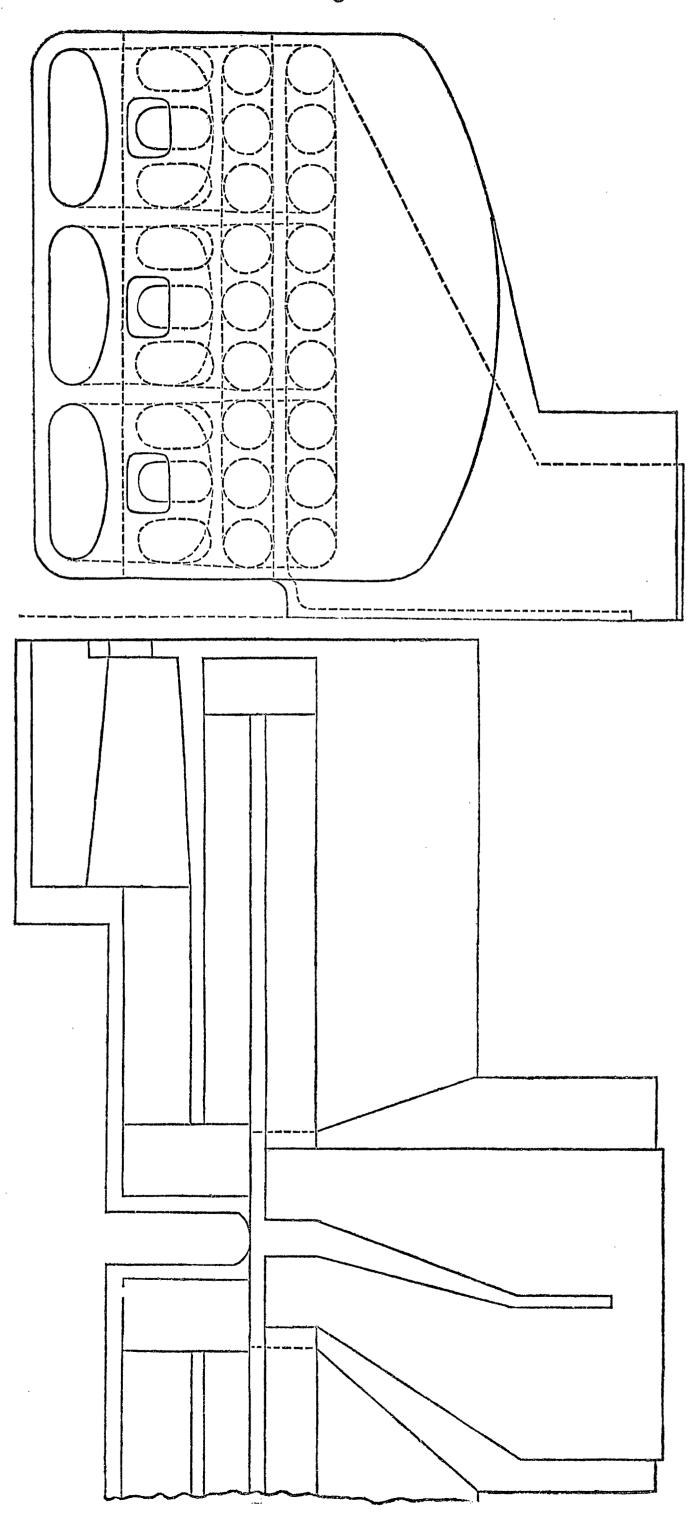


### POWHATTAN.\*

War Steamer belonging to the United States Navy. Engines and boilers designed by Charles H. Haswell, Esq., Engineer in Chief, United States Navy, and constructed by A. Mehaffy & Co., of Portsmouth, Virginia.

						Feet.	Inches.
Length on Deck,	•		•			251	0
Breadth of Beam,		•		•		45	0
Depth of Hold,	•		•			26	6
Tonnage, .		•		tons	2419		
Estimated Draft of Wat	ter,		•			18	6
Two Inclined Engines.		•					
Diameter of Cylinders,	•		a		• .	5	10
Length of Stroke,		•		o		10	0
Diameter of Paddle Wl	neels,		•			31	0
Length of Paddles,		•				10	0
Depth of " 16	and 14	inches	each,	or		2	6
Number of Double Pad				•	23		
Dip of Wheel at Estima	ated L	oad Lin	e <b>,</b>			5	6
Average Number of Re	volutio	ons,	•	•	************		
Average Pressure of Ste		·	•		******		
Cutting off at .	·	•		•	<del></del>		
Four Copper Boilers (be	ack to	back).					
Whole Amount of Fire		•		•	7884	square	e feet.
" Grat	e "	•			353	•	
Ratio of Fire Surface to	cubic	foot of	Cyline	der,	$14^{-4}$	5 to 1	•
" "		Surface	•	,	-	$\frac{3}{0}$ to 1	
Area of 1st Flues,		•		•		square	
" 2d "	0		٠		<b>57</b>	•	
" 3d "		•		•	<b>57</b>	6	4
" Chimney,	•		•		$63\frac{1}{2}$	. 6	4
Height of Chimney abo	ve Grat	te,		•		feet.	
Consumption of Bitumin		-	hour.		( <del>Janus prompol</del> a		
Water Evaporated by 1					Distribution (sp		
Coal per hour to a squa			e.		-		
- 1							

<sup>\*</sup> Not yet finished.



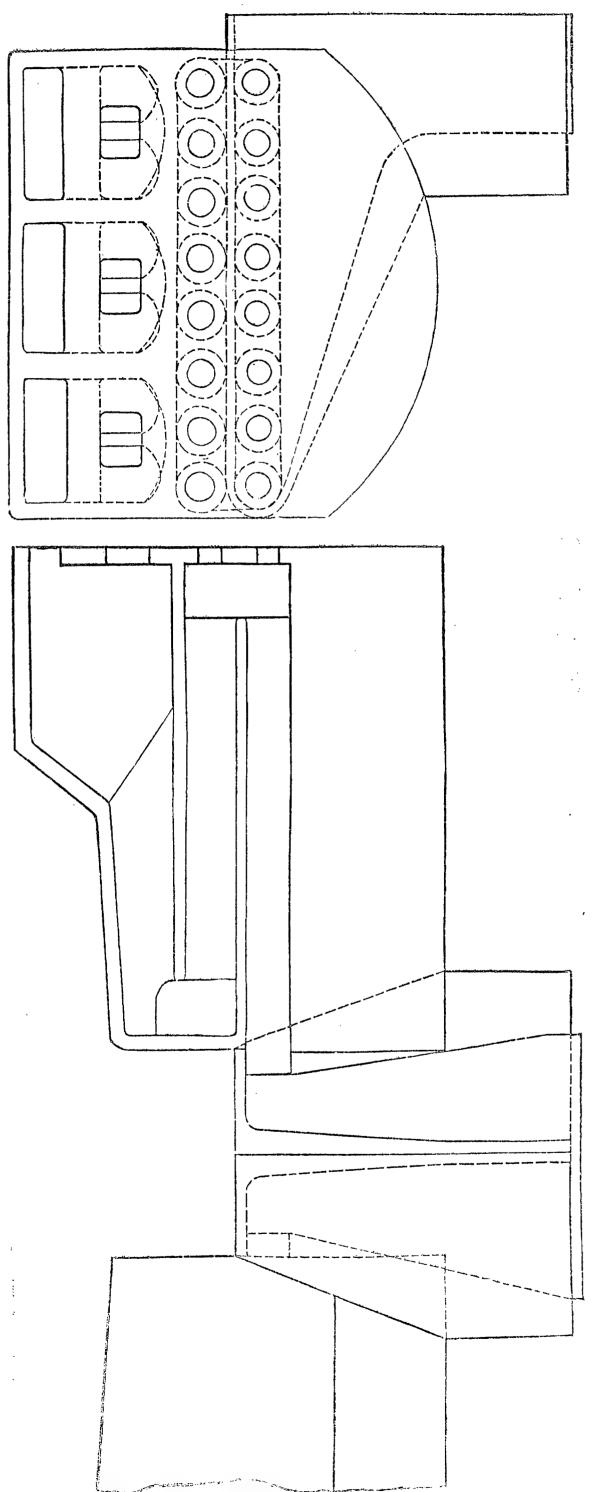
#### MISSISSIPPI.

War Steamer belonging to the United States Navy. Engines and boilers designed by Charles W. Copeland, Esq., and constructed by Merrick & Towne, of Philadelphia.

,			Feet.	Inches.
Length on Deck, .	3		225	0
Breadth of Beam,		<b>6</b>	40	0
Depth of Hold,	6		23	6
Tonnage, .		tons 1788	}	
Average Draft of Water,	8		19	0
Two Side Lever Engines.				
Diameter of Cylinders, .		ь	6	3
Length of Stroke, .	8		7	0
Diameter of Paddle Wheels, .		•	28	0
Length of Paddles, .	٠		11	0
Depth of " 20 and 16 inches	each,	or	3	0
Number of Double Paddles in each V	Vheel,	* 21		
Dip of Wheel,	•		6	0
Average Number of Revolutions,		. 11		
Average Pressure of Steam,	9	lbs. 12	}	
Cutting off at .		ь	3	0
Four Copper Boilers (back to back).		· ·		
Whole Amount of Fire Surface,	٥	5400	square	feet.
"Grate Surface,		290	6	6
Ratio of Fire Surface to cubic foot of	Cylin	der, 12	$\frac{6}{10}$ to 1	,
Grate Surfac	e,	18	$\frac{6}{10}$ to 1	,
Area of 1st Flues at back end,	6	52	square	e feet.
" 2d and 3d Flues, each		. 44	$\frac{1}{2}$	"
Chimney, .	۵	44	$\frac{1}{2}$	66
Height of "above Grate,		. 65	feet	
Consumption of Bituminous Coal per	hour,	† 2650	lbs.	
Water Evaporated by 1 lb. of Coal,	•	5	$\frac{777}{100}$ lbs	S.
Coal per hour to a square foot of Grav	te,	. 9	$\frac{1}{1}\frac{4}{0}$	

<sup>\*</sup> There are two rows of 21 paddles (half length) in each wheel.
† Result in Gulf of Mexico. Coal Inferior.

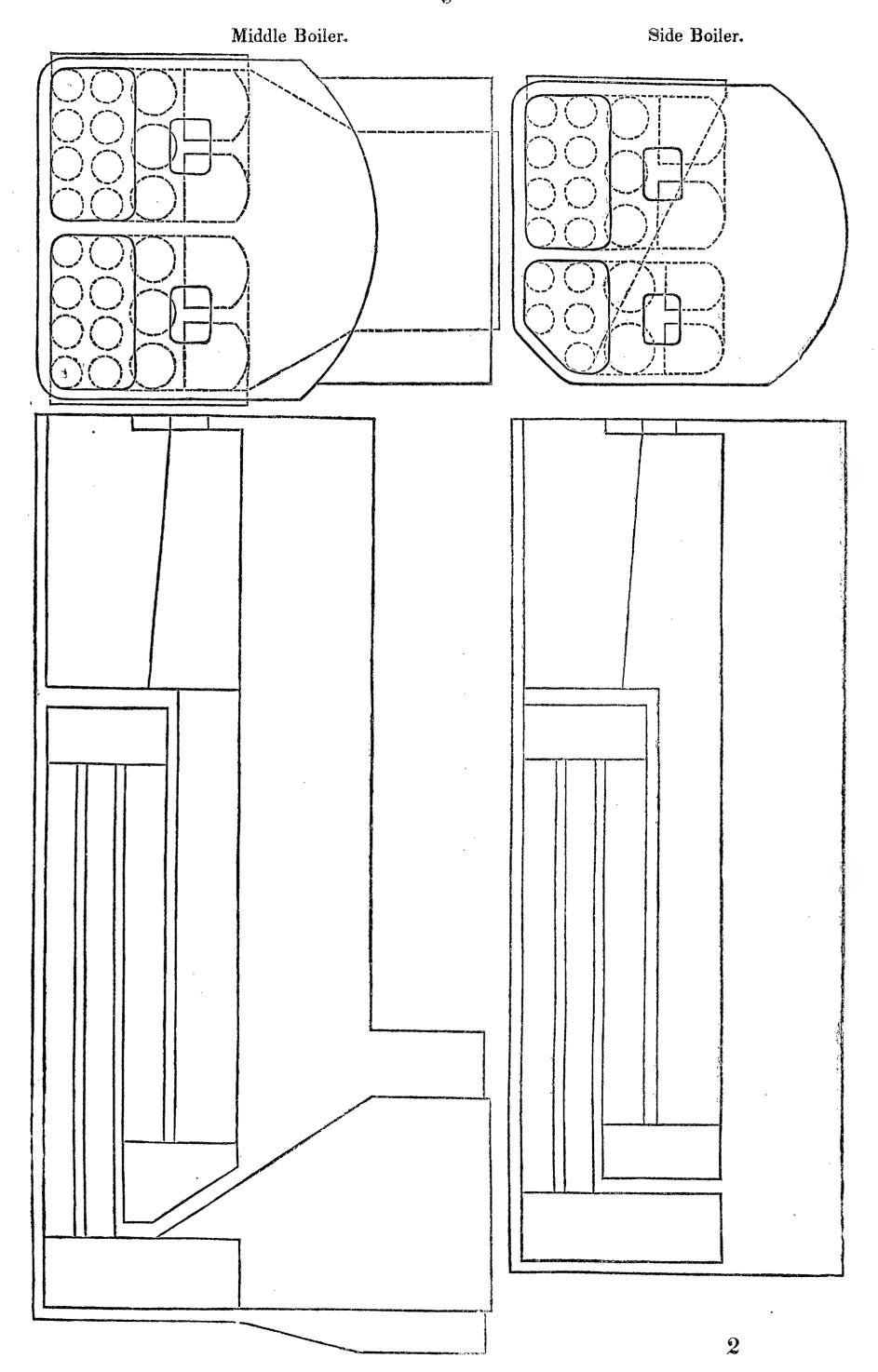




#### SARANAC.

War Steamer belonging to the United States Navy. Engines and boilers designed by Charles W. Copeland, Esq., and constructed by Jabez Coney, of Boston.

$\mathbf{F}\epsilon$	eet.	Inches.
Length on Deck,	20	0
Breadth of Beam,	37	0
Depth of Hold,	23	3
Tonnage, · tons 1426		
Average Draft of Water,	17	0
Two Inclined Engines.		
Diameter of Cylinders,	5	0
Length of Stroke,	9	0
Diameter of Paddle Wheels,	27	6
Length of Paddles,	9	0
Depth of Paddles, . 15 inches each, or	2	6
Number of Double Paddles in each Wheel, 22		
Average Dip of Wheel,	5	0
" Number of Revolutions, . 13		
" Pressure of Steam, . lbs. 14		
Cutting off at	3	6
Three Copper Boilers (side by side).		
TTTI T A	squa	are feet.
" " Grate " 188	1	"
Ratio of Fire Surface to Cubic Foot of Cylinder, 141	to 1	
" Grate Surface, $27\frac{1}{4}$		
A 0 m 1 T33		re feet.
" 2d "	_	"
" $3d$ " . $30\frac{1}{2}$	1	"
"Chimney,		"
Height of " above Grate, . 62 fe	eet.	
Consumption of Biltuminous Coal per hour, 1875 l		
Water Evaporated by 1 lb. of Coal, · 8 ·		
Coal per hour to a square foot of Grate, . 10 "	6	

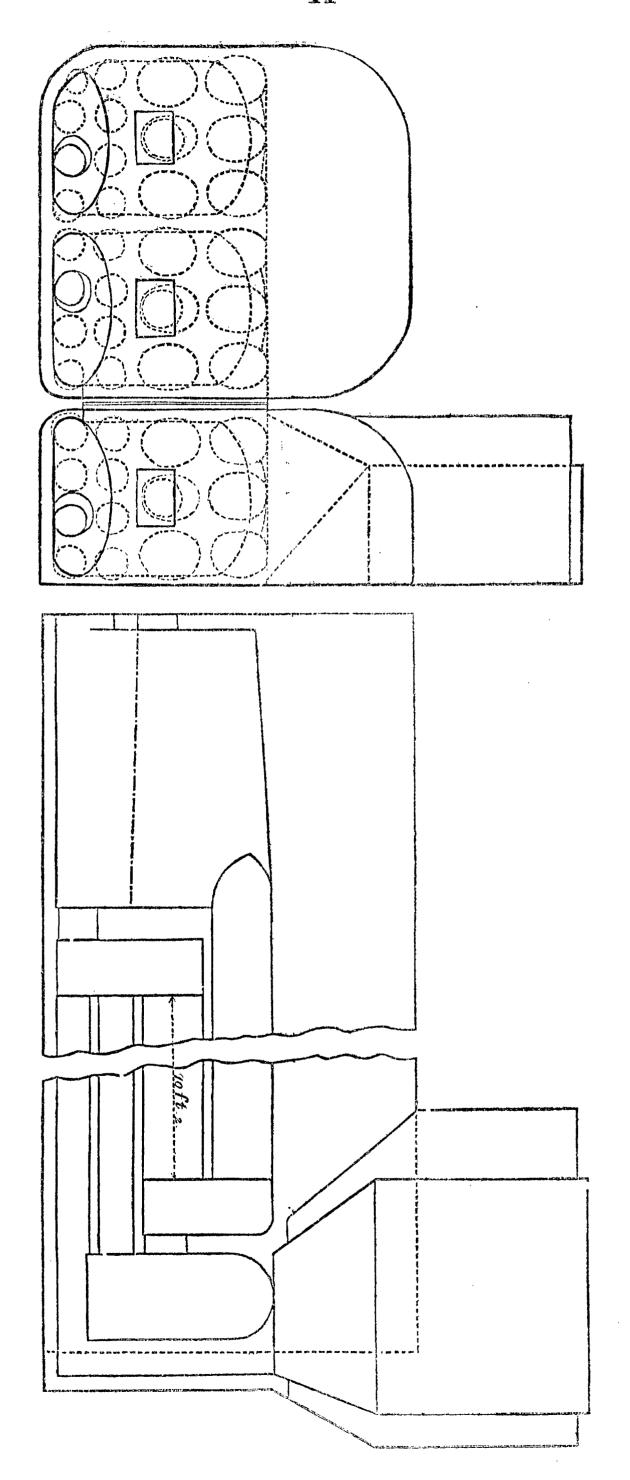


#### SAN JACINTO.\*

War Steamer belonging to the United States Navy. Engines designed by Charles H. Haswell, Esq., Engineer in Chief, and constructed by Merrick & Son, Philadelphia.

	1				Feet	Inches.
Length on Deck,	ı	ø		ø	220	0
Breadth of Beam,	ø		•	•	37	0
Depth of Hold,		•		•	23	3
Tonnage,	•		9	tons 14	126	
Average Draft of Wate	r,	ø		٠	procurate ST	
Two Inclined Engines.	•			•		
Diameter of Cylinders,		9		•	5	$2rac{1}{2}$
Length of Stroke,	•		v		4	2
Diameter of Propeller,		9		٠	14	6
Length of	9		۰		4	0
Angle at Hub,		•		٠	11°	'
" Periphery,	•		. 4	$8^{\circ}$ and	45°	
Pitch "	40	feet ex	panding	g to 45 :	feet	
Number of Blades,	•		•		4	
Area		٠		•	108 squa	are feet.
Average number of Re-	volutio	ns,	e:	stimated	30	
" Pressure of Ste	eam,	•		" lbs.	15	
Cutting off at	•		•		keritikali mara tas	
Three Copper Boilers (	side b	y side).		•		
Whole amount of Fire	Surfac	e,	•	5:	250 squ	are feet.
" Grate	, "	•		. 1	$195\frac{1}{2}$	46
Ratio of Fire Surface to	cubic	foot of	Cylinde	er,	$17\frac{3}{4}$ to 3	l.
"	Grate	Surface	e		27 to 3	<b>l</b> .
Area of 1st Flues,	•		•		35 squa	re feet.
" 2d "		ø		•	35	"
" 3d "	•		•		32	"
" Chimney,		•		•	34	"
Height of "above	e Grat	e,	•		65 feet.	,
Consumption of Bitumi	inous C	Coal per	hour,	•	Children Co.	
Water Evaporated by	1 lb. o	f Coal,	•		<del>Nervos sos</del>	
Coal per hour to a squa				•	samplements	
- X			•			

<sup>\*</sup>Not yet finished.



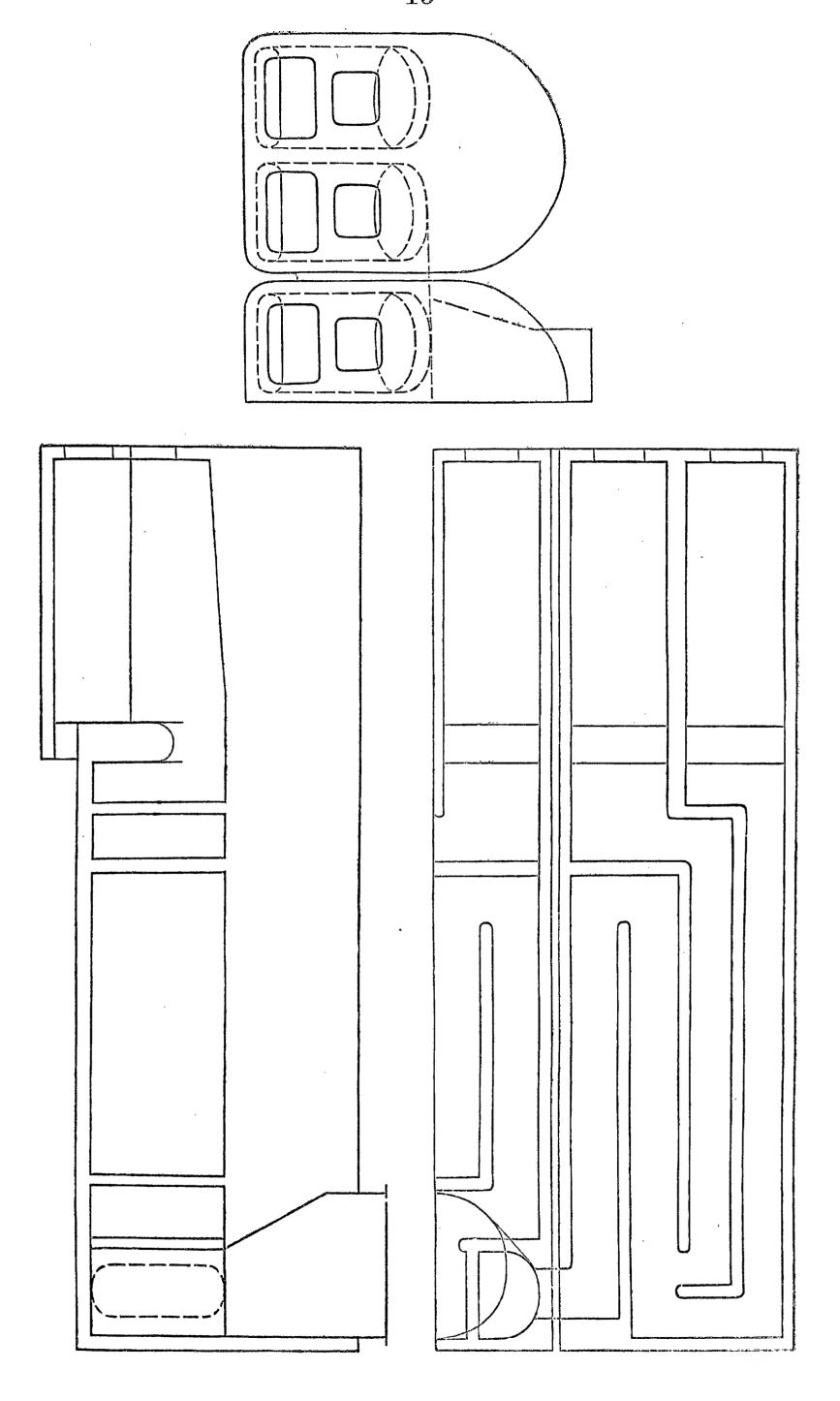
#### PRINCETON.

War Steamer belonging to the United States Navy. Engines designed by John Ericsson, Esq., and constructed by Merrick & Towne, of Philadelphia.

					Feet.	Inches.
Length on Deck,	,	· s		÷	165	2
Breadth of Beam,	9		ø		30	
Depth of Hold,		•		٠	21	8
Tonnage,	•		•	tons 6	63	
Average Draft of Wate	r forwa	rd,		15 feet,	aft, 18	6
Two Semi Cylinder En		-	rating	•	•	
Area of Cylinders, each	-	o	-	square fe		
Length of Stroke,	o		•	•	3	0
Diameter of Propeller,		ø		•	14	0
Length of	•		ď		4	0
Angle at Hub, .		e)		ø	80	
" Periphery,					51°	
Pitch at		ar s		•	35	0
Number of Blades,	•		ø		6	
Area " .		•		. 1	20 square	e feet.
Average Number of Re	evolutio	ns,*	ø	;	23	
Average Pressure of St	eam,	•		lbs.	13	
Cutting off at one-third	stroke	•				
Three Iron Boilers (sid	le by si	de).				
Whole Amount of Fire	Surfac	e,	œ	24	20 square	e feet.
" Grate	e Surfac	ee,		1	34	
Ratio of Fire Surface to	cubic	foot of	Cylin	der,	$23_{\frac{4}{10}}$ to 1	•
"	Grate	Surface	е,	, ]	l8 to 1	•
Area of 1st Flues,	•		•	9	$27\frac{1}{10}$ square	are feet.
" 2d "		G		• •	$15^{7}_{10}$	"
" Chimney,	•		•		$13_{\overline{1}}^{6}_{\overline{0}}$	66
Height of " above	e Grate	,			32 feet	
Consumption of Anthra	acite Co	oal per l	nour,	140	00 lbs.	
Water Evaporated by 1	1 lb. of	Coal,		•	$4\frac{3}{10}$ 66	
Coal per hour to a squa	are foot	t of Gra	te,		$10\frac{1}{2}$ "	
Note.—Fan blast under	r orate				_	

Note.—Fan blast under grate.

<sup>\*</sup> The above rate of speed was found to be most economical, and was the average at sea.



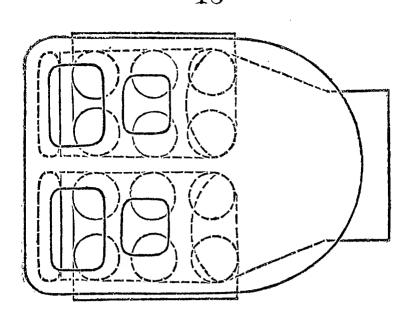
#### PRINCETON.\*

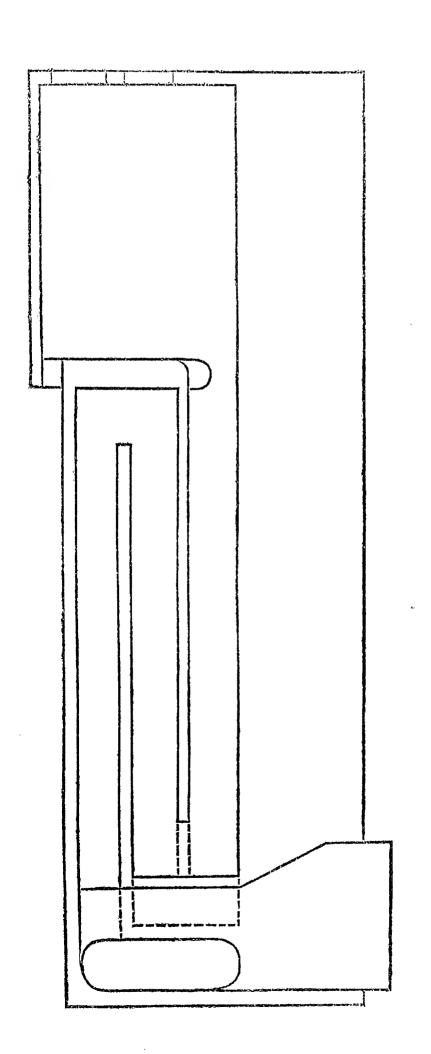
War Steamer, belonging to the United States Navy. Engines designed by John Ericsson, Esq., Boilers by Charles H. Haswell, Esq., Engineer in Chief, U. S. N., and Propeller by Robert L. Stevens, Esq.

						Feet.	Inches.
Length on Deck,		•		. •		165	2
Breadth of Beam,	•		•			30	0
Depth of Hold, .		•		•		21	8
Tonnage,	•		•	tons	663		
Average Draft of Water	er forwa	ard,	15 ft.	6 in.,	aft,	18	6
Two Semi-Cylinder Er							
Area of Cylinders, each	h		•	$17\frac{1}{3}$ s	q. ft.		
Length of Stroke,		•		•		3	0
Diameter of Propeller,	•		•			14	0
Length of		4		•		3	10
Angle at Hub,	•		٠		tuperaclass		
" Periphery,		•		•	$52^{\circ}$		
Pitch at	•		٠			<b>32</b>	0
Number of Blades,		•		٠	6		
Area of "	•		6	•	130	square	e feet.
Average Number of R	evoluti	ons,†		•	25		
Average Pressure of St	team,		•	lb	s. 12		
Cutting off at one-third	l stroke						
Three Iron Boilers (sid	le by si	de).					
Whole Amount of Fire	e Surfac	ce,	•		3000	square	e feet.
" Grat	te "	•		٥	136	(	
Ratio of Fire Surface t	o cubic	c foot	of Cylin	-	-	$\frac{8}{0}$ to 1	
"	Grate	e Surf	ace,	•		to 1	
Area of 1st Flues,	•		•		$18_{\bar{1}}$	₃ squ	are feet.
" 2d and 3d Flu	ies, eac	eh .			$16\frac{3}{4}$	•	"
" Chimney,	•		•		$13_{\overline{1}}$	$\overline{0}$	"
Height of "above	e Grate	,		• .		eet.	
Consumption of Anthra	acite Co	oal per	hour,	1	000	bs.	
Water Evaporated by	1 lb. o	f Coal,	,	•	$6_{7}$	$\frac{5}{0}\frac{5}{0}$ lbs	•
Coal per hour to a squa	are foot	t of Gi	rate,		$7_{1\over 1}$	5 66	
* With new Boilers and	l new l	Propel	ler.				

<sup>\*</sup> With new Boilers and new Propeller.

<sup>†</sup> Most economical speed at sea.



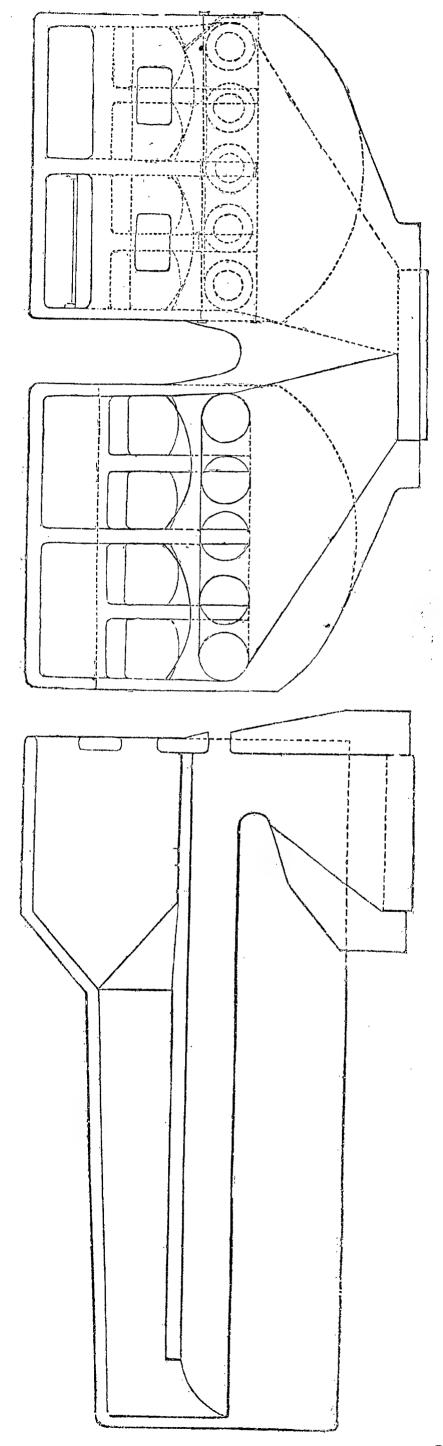


### MICHIGAN,

Iron War Steamer, belonging to the United States Navy, on Lake Erie. Engines and Boilers designed by Charles W. Copeland, Esq., and constructed by Stackhouse & Tomlinson, of Pittsburg.

Length on Deck, Breadth of Beam, Depth of Hold, Tonnage, Tonnage, Two Inclined Engines. Diameter of Cylinders, Diameter of Paddle Wheels, Length of Paddles, Depth of Double Paddles, Number in each Wheel,  27 0 27 0 27 0 27 0 27 0 27 0 27 0 27
Depth of Hold,
Tonnage,
Average Draft of Water,  Two Inclined Engines.  Diameter of Cylinders,  Length of Stroke,  Diameter of Paddle Wheels,  Length of Paddles,  The probability of the pro
Two Inclined Engines.  Diameter of Cylinders, Length of Stroke, Diameter of Paddle Wheels, Length of Paddles, Stroke,
Diameter of Cylinders,
Length of Stroke,
Diameter of Paddle Wheels, Length of Paddles, . 3 ft. 9 in. each, or 7 Depth of Double Paddles, 15 and 10 inches, or 2 1
Length of Paddles, . 3 ft. 9 in. each, or 7 6 Depth of Double Paddles, 15 and 10 inches, or 2 1
Depth of Double Paddles, 15 and 10 inches, or 2 1
•
Number in each Wheel, 2 setts of 16 each
,
Average Dip of Wheel,
Average Number of Revolutions, . 22
Average Pressure of Steam, . lbs. 15
Cutting off at
Two Iron Boilers (side by side).
Whole Amount of Fire Surface, . 1680 square feet.
" Grate " . 85 "
Ratio of Fire Surface to cubic foot of Cylinder, 15 to 1.
Grate Surface, $19\frac{3}{4}$ to 1.
Area of 1st Flues at back end, . 20 square feet.
$^{''}$ 2d $^{''}$ . $^{14\frac{9}{10}}$ $^{''}$
"Chimney, . $14\frac{2}{10}$ "
Height of "above Grate, . 54 feet.
Consumption of Bituminous Coal per hour, 1400 lbs.
Water Evaporated by 1 lb. of Coal, $6\frac{46}{100}$ lbs.
Coal per hour to a square foot of Grate, $16\frac{1}{2}$ "

Note.—The paddles of the wheels are broken both in length and depth. There are two setts of 16 double paddles to each wheel.

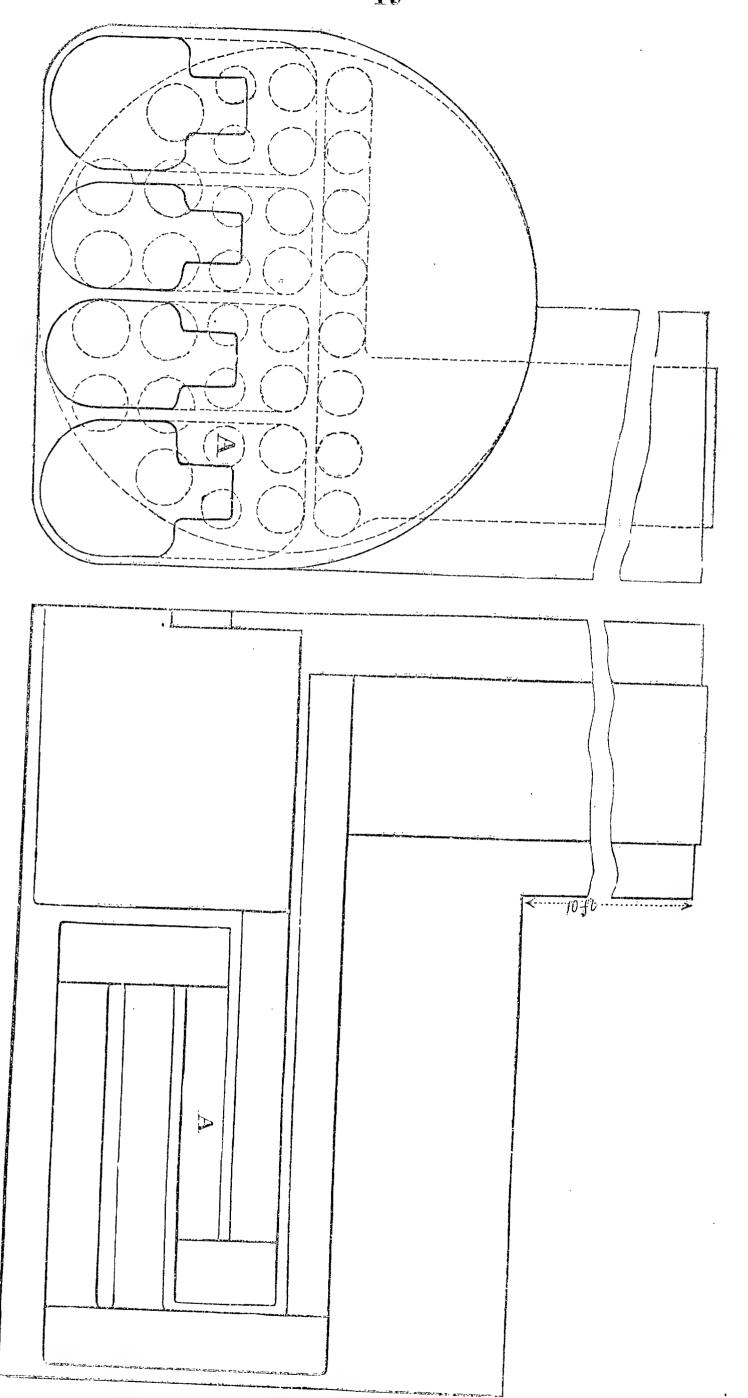


#### GEORGIA.

Merchant Steamer running between New York and New Orleans. Engines and Boilers designed and constructed by T. F. Secor & Co., New York.

						Feet.	Inches.
Length on Deck,	9		y.	•		248	8
Breadth of Beam,		<b>a</b>		٠		48	$8\frac{1}{2}$
Depth of Hold,	g		ø			25	6
Tonnage,		Ŷ		tons 26	95		
Average Draft of Water	• 9		•			15	0
Two Side Lever Engine	es,						
Diameter of Cylinders,			ij			7	6
Length of Stroke,		¥		v		8	0
Diameter of Paddle Wh	neels,		<b>y</b>			36	0
Length of Paddles,		٠		s		10	6
Depth of	è		۰			1	3
Number of Paddles in e	each W	heel,			32		
Average Dip of Wheel,		•		٥		6	0
Average Number of Re-	volutio:	ns,	ଷ		12		
Average Pressure of Ste	am,	2		lbs.	15		
Cutting off at	•		•			4	<b>O</b> *
Four Iron Boilers, in p	airs, tv	vo forv	ward a	and two			
abaft the engines, v	with tw	o chim	nies.				
Whole Amount of Fire	Surface	€,	•	94	164	square	e feet.
" Grate	66	•			26	-	. 6
Ratio of Fire Surface to	cubic	foot of	Cylin	der,	13	to 1.	
66 66	Grate	Surfac	e,		$22\frac{1}{4}$	to 1.	
Area of 1st Flues,	•				-	_	are feet.
" 2d ".		ø			39		
" 3d "	Q			ø	70,	4 0	
4th 66		ø			42		. · · · · · · · · · · · · · · · · · · ·
"Chimnies,	٠			ď	56	•	6
Height of "above G	frate,	o			<b>7</b> 5 :	feet.	
Consumption of Anthrac	cite Co	al per l	hour,	44	180	lbs.	
Water Evaporated by 1	lb. of	Coal,	-		7:	B lbs.	
Coal per hour to a squa			te,		-	[	•
-			•		-	4	

Note.—The Flues marked A are drawn too small. Their diameter is 15 inches.

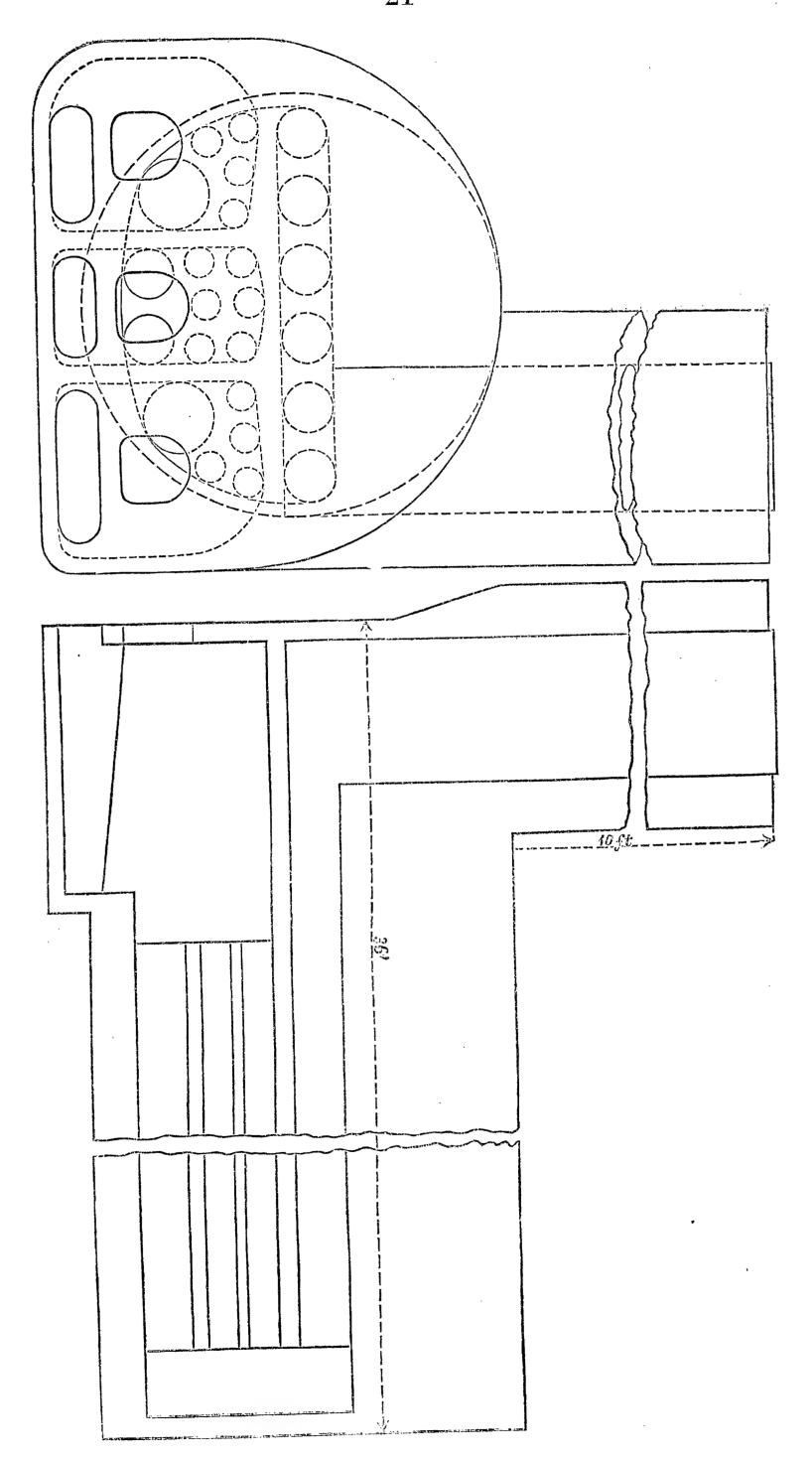


## WASHINGTON.

Merchant Steamer running between New York and Bremen. Engines and Boilers designed and constructed by Stillman, Allen & Co., New York.

		Feet.	Inches.
Length on Deck,		236	0
Breadth of Beam,		39	0
Depth of Hold,		31	0
Tonnage, tons	: 1733		
Average Draft of Water,		19	6
Two Side Lever Engines.			
Diameter of Cylinders,		6	0
Length of Stroke,		10	O
Diameter of Paddle Wheels,		34	8
Length of Paddles,	,	7	6
Depth of "·	,	3	4
Number of Paddles in each Wheel,	28		
Average Dip of Wheel,		6	4
Average Number of Revolutions,	. 11		
Average Pressure of Steam,	lbs. 12		
Cutting off at .	•	3	4.
Two Iron Boilers (side by side).			
Whole Amount of Fire Surface,	5760	square	
Grate Surface,	182		"
Ratio of Fire Surface to cubic foot of Cylinder,	10	$\frac{2}{10}$ to .	1.
" Grate Surface,	32	to I	
Area of 1st Flues,			re feet.
" 2d "·	. 21		
" Chimney, .	33	$3\frac{2}{10}$	"
Height of " above Grate,	. 75	feet.	
Consumption of Bituminous Coal per hour,*	3920	lbs.	
Water Evaporated by 1 lb. of Coal,	4	$\frac{1}{1} \frac{7}{0} \frac{7}{0} $ 1	bs.
Coal per hour to a square foot of Grate,	0 /	23	66

<sup>\*</sup> Fan blast under grate.



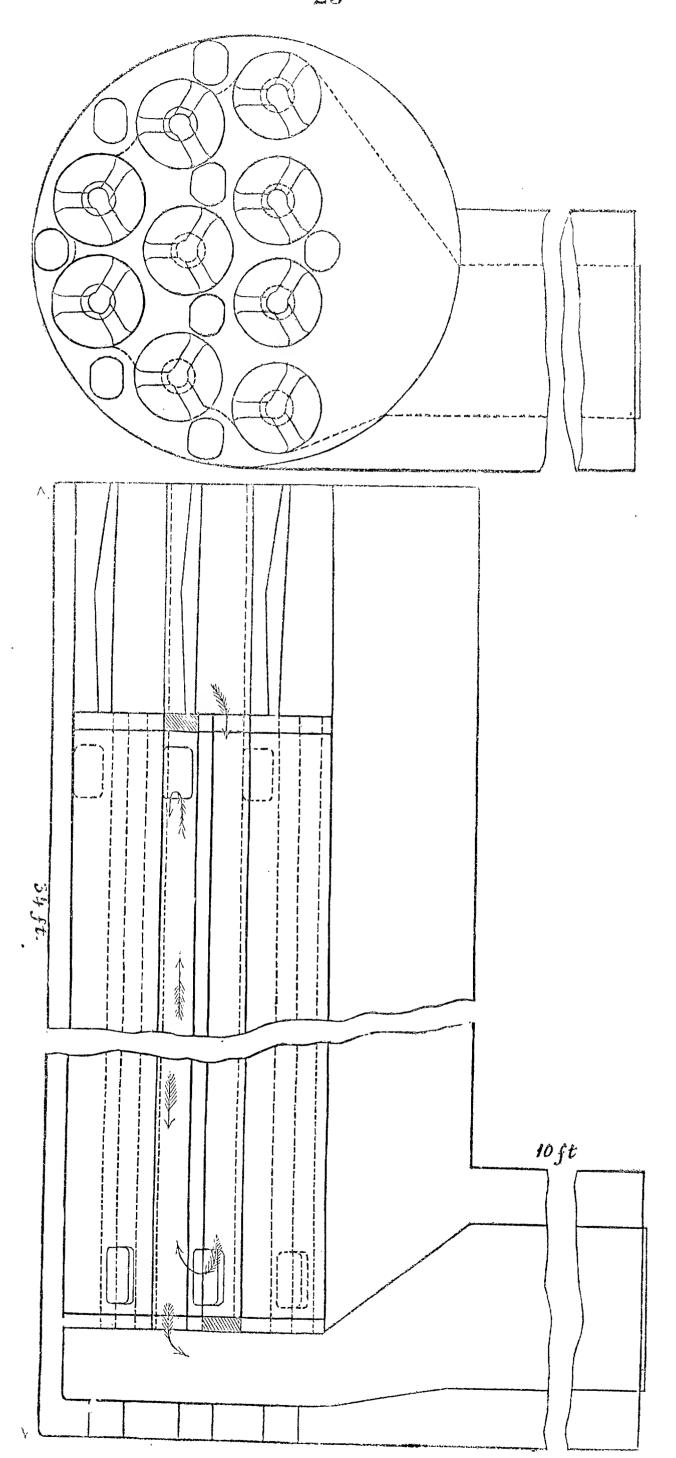
### **WASHINGTON.**\*

Merchant Steamer running between New York and Bremen. Engines and Boilers designed and constructed by Stillman, Allen & Co., New York.

		Feet.	T. 1
Length on Deck,	,	236	$\begin{array}{c} \text{Inches.} \\ 0 \end{array}$
Breadth of Beam;	•	<b>23</b> 0	0
Depth of Hold,		31	0
Tonnage	tons 1		Ø
Average Draft of Water,	COILD I	19	6
Two Side Lever Engines.	ė ,	19	O
Diameter of Cylinders,		6	Λ
Length of Stroke.	•	10	0
Diameter of Paddle Wheels,			0
Length of Paddles,	•	34	8
Depth of Paddles,		3	6
Number of Paddles in each Wheel,	•	28	4
Average Dip of Wheel,		6	4
"Number of Revolutions,	ei		.4
" Pressure of Steam, .	lbs.	11	
Cutting off at .	108.		0
Two Iron Boilers (side by side).†		3	0
Whole Amount of Fire Surface,	G	700 ~	C ,
" "Grate "		798 squa	re feet.
Ratio of Fire Surface to cubic foot of Cylinder,		292 19. 4- 1	• •
"Grate Surface,		12 to 1.	
Area of 1st, 2d, and 3d Flues, each		$23\frac{1}{2}$ to 1.	<b>a</b> .
"Chimney,		$22\frac{1}{2}$ square	
Height of " above Grate,		$33\frac{2}{10}$	i
Consumption of Bituminous Coal per hour,		75 feet.	
Water Evaporated by 1 lb. of Coal,		80 lbs.	
Coal per hour to a square foot of Grate,		$5\frac{32}{100}$ "	
residence for the Grate,	• .	$10\frac{1}{2}$ "	
No. Therefore			

<sup>\*</sup> With new boilers.

<sup>†</sup> The Boilers are on Miller's patent. In this case, the natural draft through the flues, as shown in section, not being sufficient, the draft was made direct through all the flues.



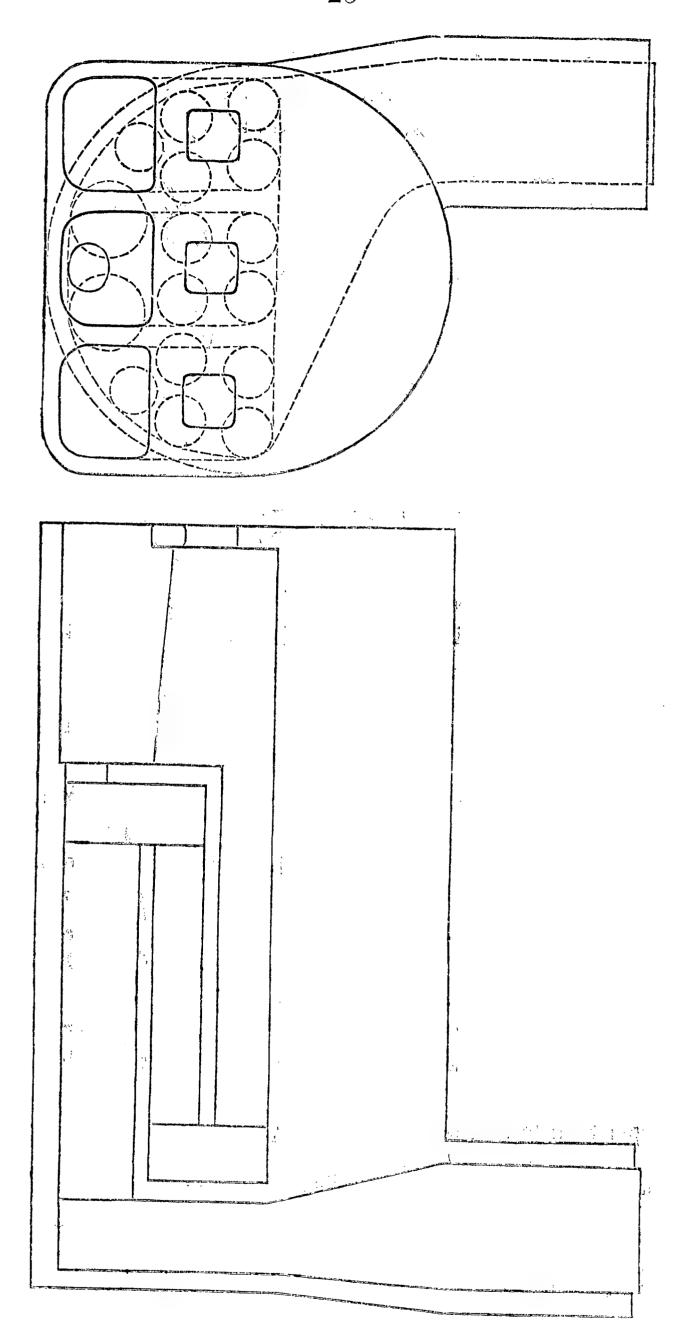
### UNITED STATES.

Merchant Steamer running from New York to Liverpool. Engines and Boilers designed and constructed by T. F. Secor & Co., New York.

				Feet.	Inches.
Length on Deck, .	o			250	0
Breadth of Beam, .		٠.9		40	0
Depth of Hold,	9			31	0
Tonnage,		tons 19	04		
Average Draft of Water,	.0			15	9
Two Side Lever Engines.					
Diameter of Cylinders, .	۰,			6	8
Length of Stroke,		a,		9	0
Diameter of Paddle Wheels,	<b>.</b> 9			34	8
Length of Paddles, .		.0		8	6
Depth of ".	•			2	.6
Number of Paddles in each Wheel,		•	28		
Average Dip of Wheel, .	,0			5	0
Average Number of Revolutions,*		,•	12		
Average Pressure of Steam,	۰	lbs.	12		
Cutting off at		<b>G</b>		4	6
Four Iron Boilers (back to back).	•				
Whole Amount of Fire Surface,		51	24 :	square	e feet.
"Grate"			34	-	
Ratio of Fire Surface to cubic foot of	Cylir	ider,	8-2	$\frac{2}{0}$ to 1	. •
"Grate Surface,	•	-	_	$\frac{1}{0}$ to 1	
Area of 1st, 2d, and 3d Flues, each			_	square	_
" Chimney	0		42	.6	
Height of "above Grate,		o	<b>6</b> 5 ±	feet.	•
Consumption of Anthracite Coal per he	our,†	44	00	lbs.	
Water Evaporated by 1 lb. of Coal,	, ,			8 "	
Coal per hour to a square foot of Grate	•		_	8 8 0	
1	,		X	U	

<sup>\*</sup> Results from first passage to Liverpool.

<sup>†</sup> Fan blast under grate.

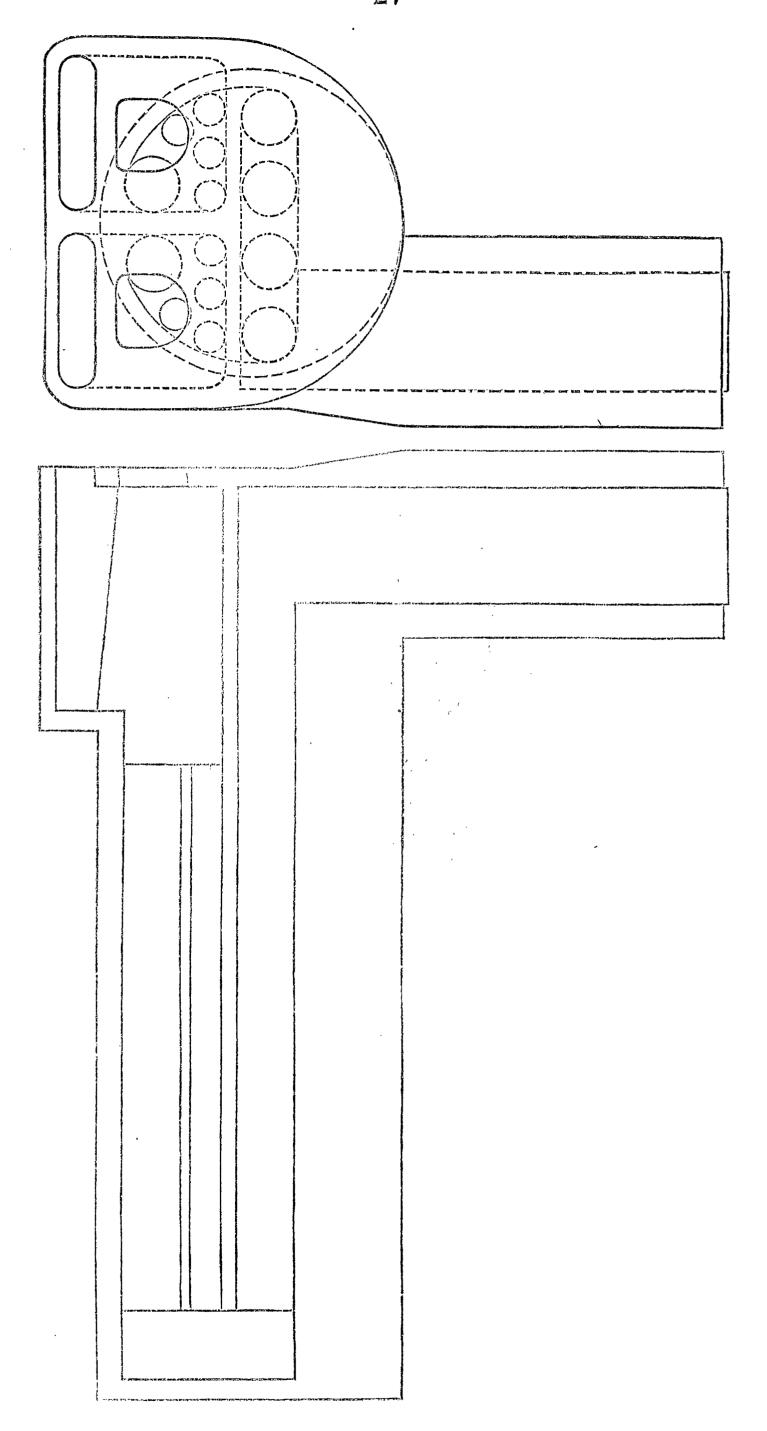


#### NORTHERNER.

Merchant Steamer running between New York and Charleston. Engine and boilers designed and constructed by Stillman, Allen & Co., of New York.

	Feet	Inches.
Length on Deck,	205	0
Breadth of Beam,	32	8
Depth of Hold, · · ·	22	6
Tonnage, . tons	1013	
Average Draft of Water,	12	
One Side Lever Engine.		
Diameter of Cylinder,	5	10
Length of Stroke, .	8	0
Diameter of Paddle Wheels,	31	0
Length of Paddles,	7	6
Depth of "·	2	6
Number of Paddles in each wheel, .	24	
Average Dip of Wheel,	4	9
Average Number of Revolutions, .	14	
Average Pressure of Steam, . lb	s. 18	
Cutting off at	4	0
Two Iron Boilers (side by side).		_
Whole Amount of Fire Surface,	2726 squa	
"Grate".	110	"
Ratio of Fire Surface to cubic foot of Cylinder,	$12rac{3}{4}$ to	1.
" Grate Surface	$24_{10}^{9}$ to	_
Area of 1st Flues, .	$18_{\frac{4}{10}}$ so	quare feet.
" 2d "	$17rac{6}{10}$	
" Chimney, .	$16\frac{6}{10}$	
Height of "above Grate, .	55 feet	· •
Consumption of Anthracite Coal per hour,*	2240 lbs	5.
Water Evaporated by 1 lb. of Coal, .	O	6
Coal per hour to a square foot of Grate, .	$20_{\frac{4}{10}}$ '	Ç

<sup>\*</sup> Fan blast under grate.

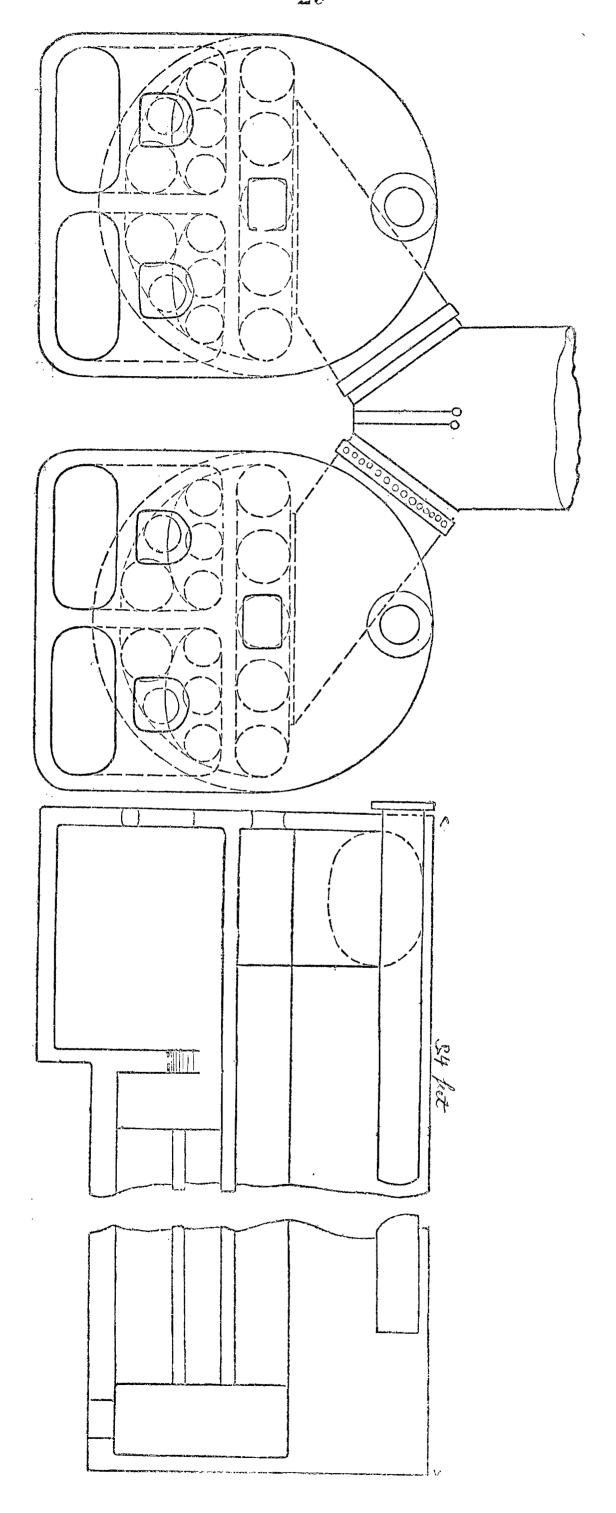


### FALCON,

Merchant Steamer running between New York, Havana, and New Orleans. Engines and boilers designed and constructed by Hogg & Delamater, of New York.

		Feet.	Inches.
Length on Deck,	c	206	0
Breadth of Beam,	,	30	6
Depth of Hold,	6	21	O
Tonnage,	tons 878	3	,
Average Draft of Water,	i .	12	O
Two Inclined Engines.			
Diameter of Cylinders, .	•	5	()
Length of Stroke,	,	5	O
Diameter of Paddle Wheels,	•	32	
Length of Paddles,		7	0 9
Depth of ".	φ	1	3
Number of Paddles in each Wheel,	2	4	· ,
Average Dip of Wheel, .	e	5	Q
Average Number of Revolutions,	1	5	i
Average Pressure of Steam, .	lbs. 1	4	
Cutting off at .		2	6
Two Iron Boilers (side by side).			·
Whole Amount of Fire Surface,	250	0 şquar	e feet.
"Grate Surface,	10	1	66
Ratio of Fire Surface to cubic foot of Cylin	der, 1	$2\frac{3}{4}$ to 1.	•
"Grate Surface,	. 2	$4\frac{1}{2}$ to 1	•
Area of 1st Flues,	2	$20rac{8}{10}$ squ	uare feet.
" 2d "	. 1	.8	"
" Chimney,	2	21	66
Height of " above Grate,	. 6	5 feet	
Consumption of Bituminous Coal per hour,	* 224	0 lbs.	
Water Evaporated by 1 lb. of Coal,		$\frac{1}{2}$ "	
Coal per hour to a square foot of Grate,	25	21066	

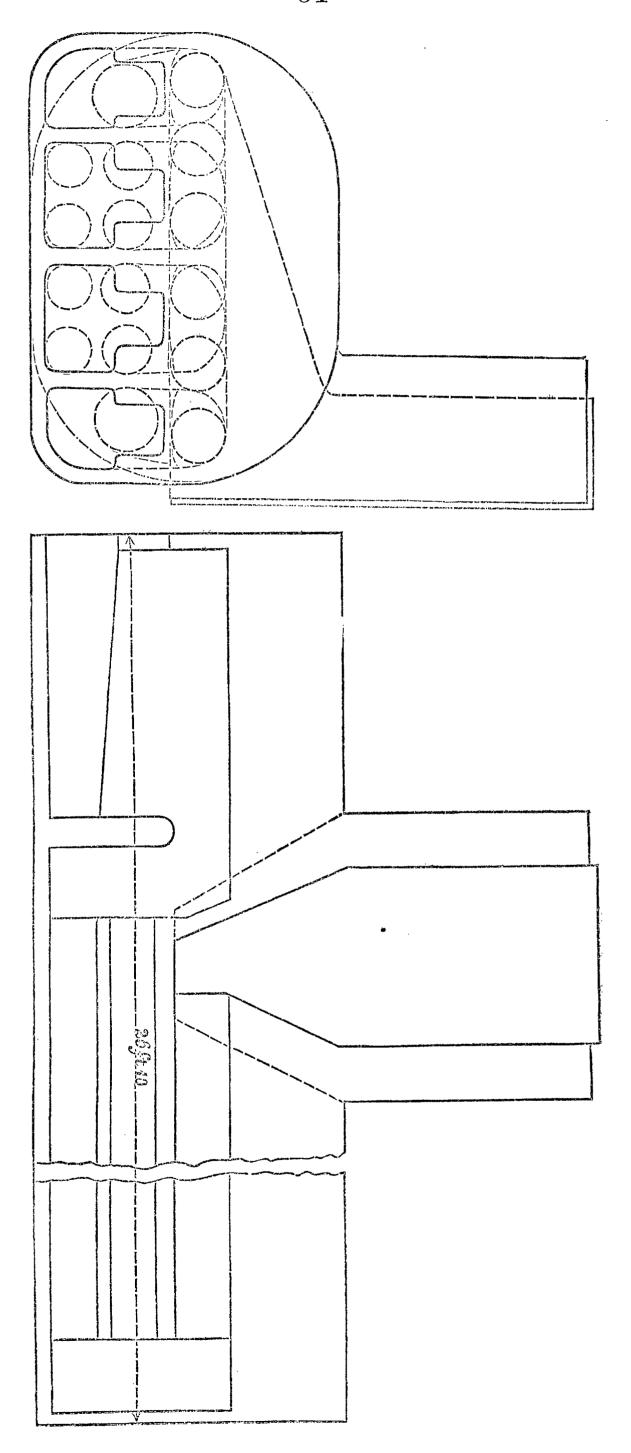
<sup>\*</sup>Fan blast under grate.



#### PHILADELPHIA.

Merchant Steamer running between New York and Chagres. Engines and boilers designed and constructed by Merrick & Towne, of Philadelphia.

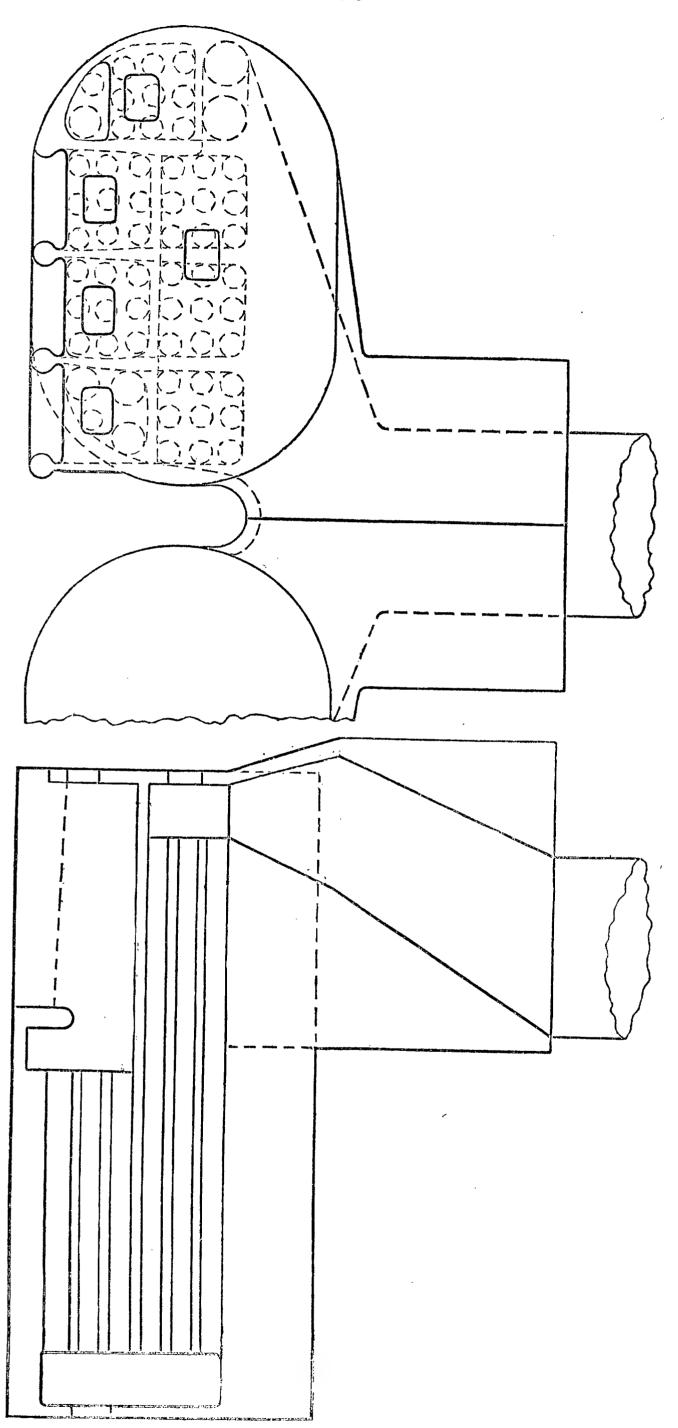
			Feet.	Inches.
Length on Deck, .			190	0
Breadth of Beam,		•	33	0
Depth of Hold,	,•		18	3
Tonnage,		tons $97$		.0
Average Draft of Water,	.0	tons or	10	6
Two Side Lever Engines.		•	10	Ü
Diameter of Cylinders,			4	8
•	ه.		6	9
Length of Stroke,		.•	27	0
Diameter of Paddle Wheels,	.•		8	6
Length of Paddles,		.•	$\frac{3}{2}$	6
Depth of ".  Number of Deviller in each Wheel	ه,	o.		,O
Number of Paddles in each Wheel,	•	. 24	_	0
Average Dip of Wheel,	•	4	4.	.0
Average Number of Revolutions,		. 1		
Average Pressure of Steam,	,0	lbs. 1		41
Cutting off at		•	3	$4\frac{1}{2}$
Two Iron Boilers (side by side).			_	
Whole Amount of Fire Surface,	•		) square	
"Grate".		. 15	5	<b>: 6</b>
Ratio of Fire Surface to cubic foot	of Cylin	der, 15	to 1.	
"Grate Surf	face,	. 21	to 1.	
Area of 1st Flues, .	•	35	3 square	feet.
" 2d " .		. 23	,	6
Chimney,	•	24	6	6
Height of "above Grate,		. 63	feet.	
Consumption of Anthracite Coal pe	r hour,	2000	lbs.	
Water Evaporated by 1 lb. of Coal	-	. 7	$\frac{2}{10}$ lbs.	
Coal per hour to a square foot of G	*	12	- 0	



#### REPUBLIC.

Merchant Steamer running between Panama and San Francisco. Engines and boilers designed and constructed by Murry & Hazlehurst, of Baltimore.

	Feet.	Inches.
Length on Deck,	207	0
Breadth of Beam,	30	0
Depth of Hold,	18	6
Tonnage, tons 862	2	
Average Draft of Water,	11	9
Two Oscillating Engines.		
Diameter of Cylinders,	4	6
Length of Stroke, .	6	0
Diameter of Paddle Wheels,	25	6
Length of Paddles,	8	9
Depth of Double Paddles, 14 inches each, or	. 2	4
Number of Double Paddles in each Wheel, 21		
Average Dip of Wheel,	3	2
Average Number of Revolutions, 14	<u></u>	•
Average Pressure of Steam, . lbs. 12	<u> </u>	
Cutting off at	4	0
Two Iron Boilers (side by side).		
	3 square	e feet.
" Grate " . 123	•	66
	to 1.	
" Grate Surface, 31	to 1.	
	$rac{1}{4}$ squar	re feet.
" 2d " . 21		66
"Chimney,	•	66
Height of "above Grate, . 50	feet.	•
Consumption of Anthracite Coal per hour, 1960	lbs.	
Water Evaporated by 1 lb. of Coal, 6	85 lbs	la
	9 66	

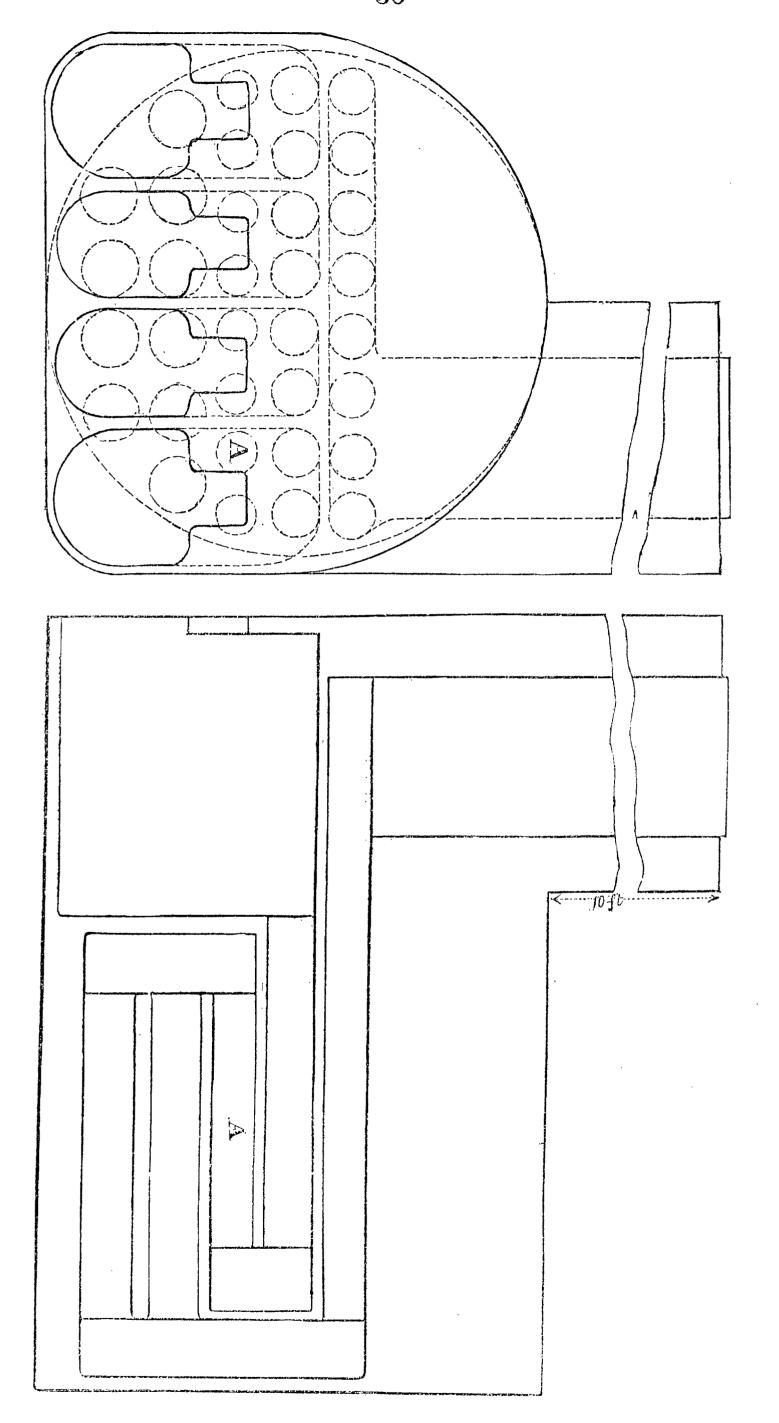


#### OHIO.

Merchant Steamer running between New York and New Orleans. Engines and Boilers designed and constructed by T. F. Secor & Co., New York.

			Feet.	Inches.
Length on Deck,	y.		247	10
Breadth of Beam, .		•	45	7
Depth of Hold,	ø		24	6
Tonnage, .		tons 2397		
Average Draft of Water,	0		15	6
Two Side Lever Engines.				
Diameter of Cylinders,	•		7	6
Length of Stroke,		•	8	0
Diameter of Paddle Wheels,	٠		36	0
Length of Paddles,		ø	10	6
Depth of "·	o		1	3
Number of Paddles in each Wheel,		32		
Average Dip of Wheel, .		•	6	6
Average Number of Revolutions,	g	12		
Average Pressure of Steam, .		lbs. 15		
Cutting off at .	•		4	0
Four Iron Boilers, in pairs, two forv	ward a	and two		
abaft the engines, with two chim				
Whole Amount of Fire Surface,	•	9464	squar	e feet.
" Grate ".		426	-	"
Ratio of Fire Surface to cubic foot of	Cylin	der, 13	to 1	•
" " Grate Surfac	•	_	$\frac{1}{4}$ to 1	•
Area of 1st Flues, .	,	. 44	$\frac{1}{10}$ squ	iare feet.
" 2d "		39		"
" 3d " .		. 70	$\frac{4}{10}$	"
4th ".		42		66
" Chimnies, .		. 56	3	66
Height of "above Grate, .		<b>7</b> 5	feet.	
Consumption of Anthracite Coal per	hour.	_	lbs.	
Water Evaporated by 1 lb. of Coal,	<del></del> 9		$7\frac{3}{4}$ lbs.	
Coal per hour to a square foot of Gra	ite.		$\frac{1}{2}$ "	
Cour per mour to a square root or ona	,,	1.	2	

Note.—The Flues marked A are drawn too small. Their diameter is 15 inches.

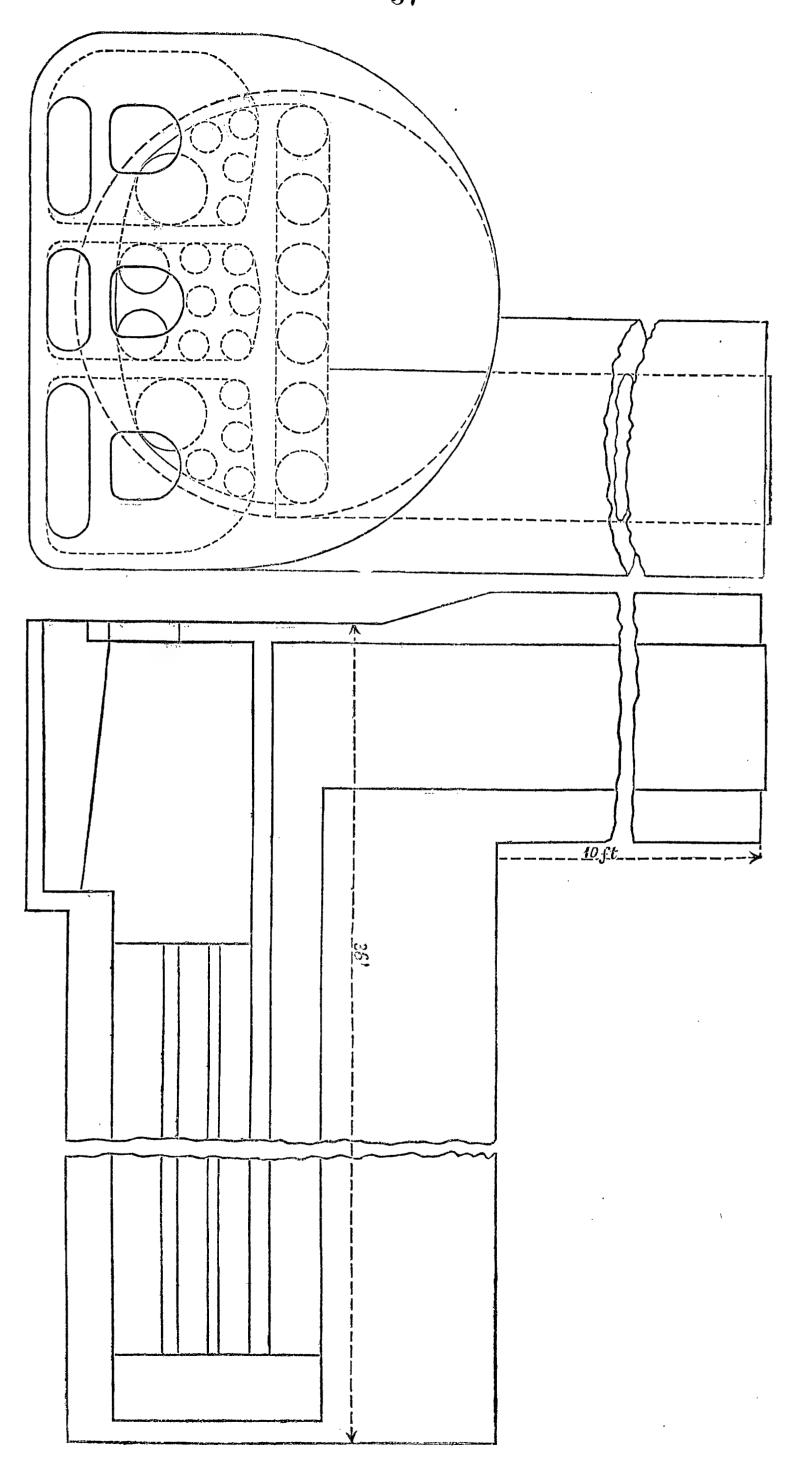


## HERMANN,

Merchant Steamer running between New York and Bremen. Engines and Boilers designed and constructed by Stillman, Allen & Co., New York.

					Feet.	Inches.
Length on Deck,	•	· .			240	0
Breadth of Beam,	•				40	O
Depth of Hold,	<b>.</b>		•		31	0
Tonnage, .			tons	s 1819		
Average Draft of Water,		,	,		19	6
Two Side Lever Engine	es.					
Diameter of Cylinders,	•		,		6	0
Length of Stroke,	•	•			10	0
Diameter of Paddle Whe	eels, .		•		36	O
Length of Paddles, .		•			8	0
Depth of "	•	18 i	nches e	ach, or	3	0
Number of Double Padd	lles in ea			28	,	
Average Dip of Wheel,		•			7	6
Average Number of Rev	olutions	,	•	11		
Average Pressure of Stea	am,		1	bs. 12		
Cutting off at .	•		•		3	4
Two Iron Boilers (side b	y side).					
Whole Amount of Fire S	Surface,	•		5760	square	e feet.
"Grate	Surface	,		182	_	Ç
Ratio of Fire Surface to	cubic fo	ot of Cy	linder,	$10_{\scriptscriptstyle{7}}$	$\frac{2}{0}$ to 1	. •
ee ee çe	Grate S	ırface,		32		
Area of 1st Flues, .		•		36	squar	e feet.
" 2d "	•		•	$21_{T}$		66
" Chimney, .		•		-	2	"
Height of "above	Grate,		•		feet.	
Consumption of Bitumine	ous Coa	l per ho	ur,*	3920	lbs.	
Water Evaporated by 1 l	lb. of Co	al,	•	4,	$\frac{77}{00}$ lb	S,
Coal per hour to a square	e foot of	Grate,	•		$\lfloor rac{1}{2} \rfloor$	

<sup>\*</sup> Fan blast under grate.

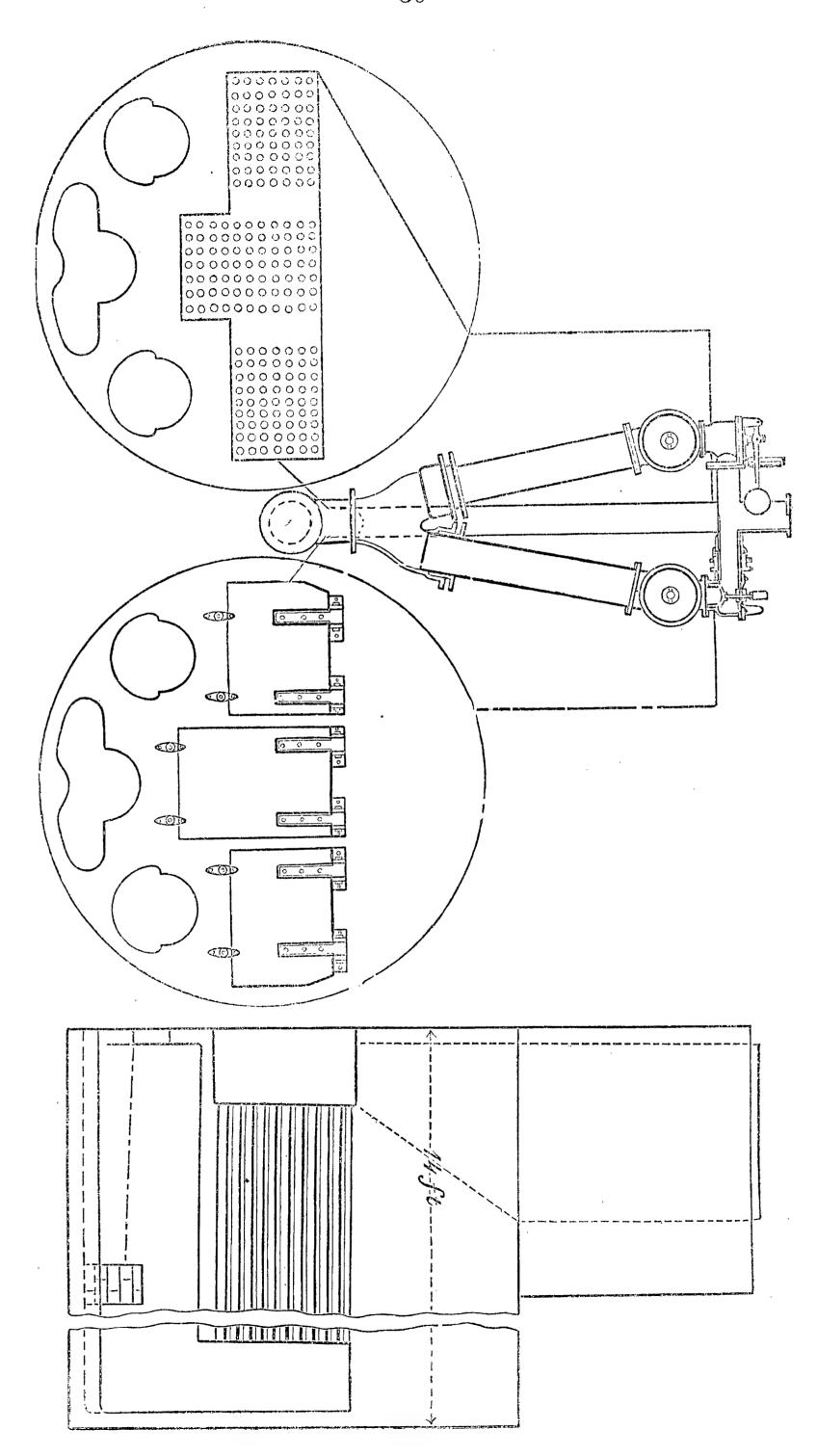


# $\mathbf{HERMANN.}^*$

Merchant Steamer running between New York and Bremen. Engines by Stillman, Allen & Co.; Boilers designed by Erastus W. Smith, Esq., and constructed by Mott & Ayres, New York.

•		Feet.	Inches.
Length on Deck,	•	241	0
Breadth of Beam,		40	0
Depth of Hold, .	.•	31	0
Tonnage, to	ns 1819		
Average Draft of Water,	•	19	6
Two Side Lever Engines.			
Diameter of Cylinders,	•	6	0
Length of Stroke, .		10	0
Diameter of Paddle Wheels,	.•	36	0
Length of Paddles, .		8	0
Depth of Paddles, .	, <del>s</del>	. 2	2
Number of Paddles in each Wheel,	23	8	
Average Dip of Wheel, .	<sub>,</sub> a	7	6
" Number of Revolutions,	13	2	
" Pressure of Steam,	lbs. 12	2	
Cutting off at .		3	6
Four Iron Boilers, with 2 Chimnies.			
Whole Amount of Fire Surface, .			are feet.
" Tube "	577	6	"
"Grate"	27	3	"
Ratio of Fire Surface to cubic foot of Cylinder,	14	$\frac{8}{10}$ to	1.
"Grate Surface,	.30	$\frac{6}{10}$ to	1.
Area of Tubes,	39	squar	re feet.
" Chimnies, .	47	$\frac{1}{2}$	"
Height of " above Grate, .	75	feet.	
Consumption of Bituminous Coal per hour,	354	6 lbs.	•
Water Evaporated by 1 lb. of Coal,		$5_{10}^{5}$	6
Coal per hour to a square foot of Grate,	. 1		

<sup>\*</sup> With new boilers.

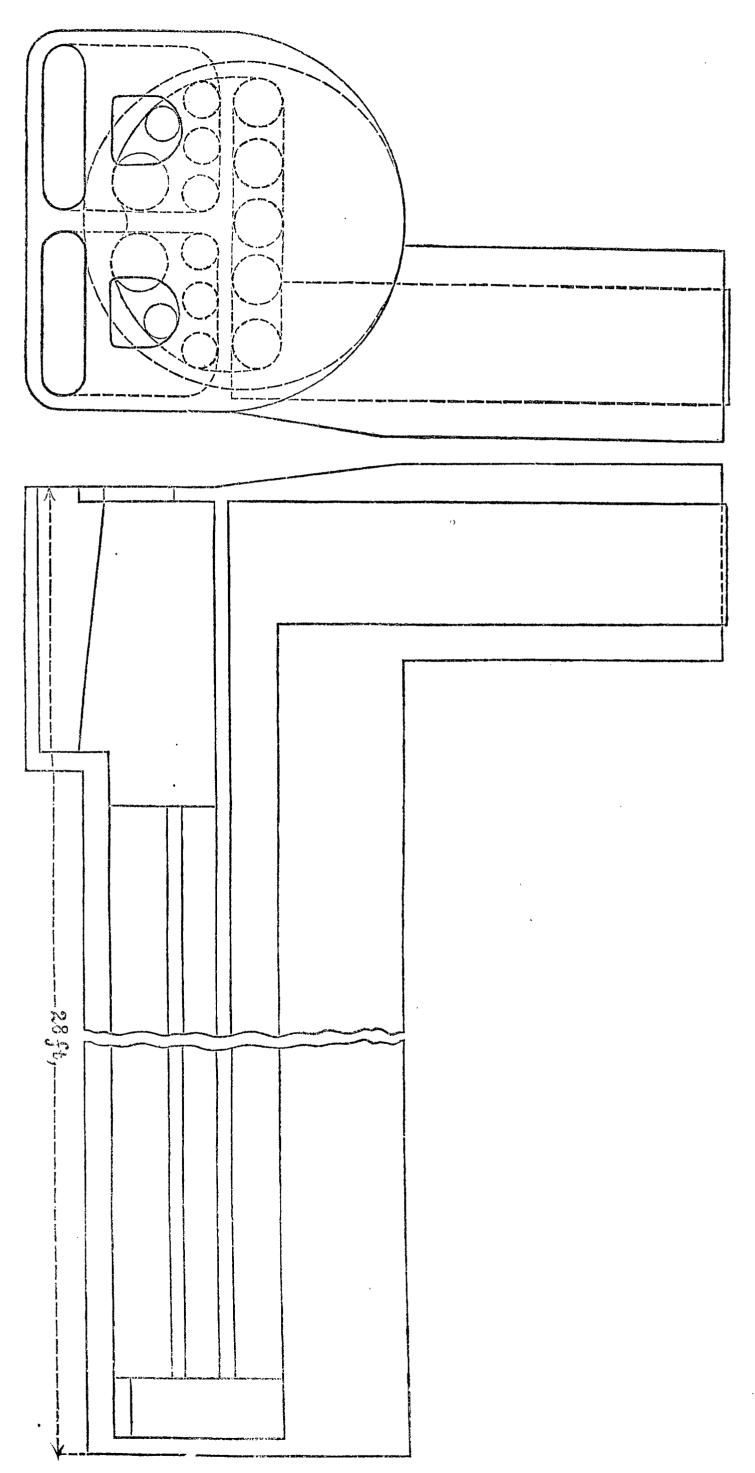


## CHEROKEE.

Merchant Steamer running between New York and Chagres. Engine and Boilers designed and constructed by Stillman, Allen & Co., New York.

		Féet.	Inches.
Length on Deck,		210	0
Breadth of Beam,	e	35	2
Depth of Hold,		22	0
Tonnage, .	ton's 1241		
Average Draft of Water,		13	0
One Side Lever Engine.			
Diameter of Cylinder, .		6	3
Length of Stroke,	<u>.</u>	8	0
Diameter of Paddle Wheels,		31	4
Length of Paddles,	•	8	<b>6</b>
Depth of " . 15 incl	hes each, or	2	6
Number of Paddles in each Wheel,	. 24		J
Average Dip of Wheel, .		5	0
Average Number of Revolutions,	. 15		•
Average Pressure of Steam,	lbs. 16		
Cutting off at .	•	4	0
Two Iron Boilers (side by side).			•
Whole Amount of Fire Surface,	2986	square	feet.
"Grate"	126	"	
Ratio of Fire Surface to cubic foot of Cylin	_	$\frac{17}{00}$ to	1.
"Grate Surface,	-	$\frac{6}{6}$ to 1.	
Area of 1st Flues,	-	•	re feet.
" 2d "	$16^{\circ}$	0 -9 -4	
"Chimney,	$17\frac{1}{2}$	"	
Height of " above Grate,		feet.	
Consumption of Anthracite Coal per hour,*		lbs.	
Water Evaporated by 1 lb. of Coal,	_	33 (6	
Coal per hour to a square foot of Grate,	16	00	
*			

<sup>\*</sup> Fan blast under grate.



#### ATLANTIC.

Merchant Steamer running between New York and Liverpool. Engines designed and constructed by Stillman, Allen & Co., of New York; boilers by John Faron, Esq., Chief Engineer of the Line.

	Feet.	Inches.
Length on Deck,	. 285	0
Breadth of Beam,	45	8
Depth of Hold, .	. 32	0
Tonnage, to	ons $2772$	
Average Draft of Water, .	. 19	0
Two Side Lever Engines.		
Diameter of Cylinders, .	. 7	11
Length of Stroke,	9	0
Diameter of Paddle Wheels, .	. 35	0
Length of Paddles,	12	4
Depth of ".	. 2	2
Number of Paddles in each Wheel, .	36	
Average Dip of Wheel, .	. 7	2
Average Number of Revolutions, .	$13\frac{1}{2}$	
Average Pressure of Steam, .	lbs. 14	
Cutting off at	4	0
Four Iron Boilers (back to back); tubes 2 in. de	iameter outsi	de.
Whole Amount of Fire Surface,	19,044 squa	are feet.
"Tube".	13,560	66
"Grate".	572	"
Ratio of Fire Surface to cubic foot of Cylinder,	$21\frac{1}{2}$ to	1.
" Grate Surface	$33\frac{1}{4}$ to	1.
Area of space between tubes in front, .	111 squ	are feet.
" at back,	$73\frac{1}{2}$	"
"Chimney,	63	"
Height of "above Grate, .	75 feet	•
Consumption of Bituminous Coal per hour,	5880 lbs	•
Water Evaporated by 1 lb. of Coal, .	$7\frac{1}{2}$ (	6
Coal per hour to a square foot of Grate,	$10\frac{3}{10}$ '	6

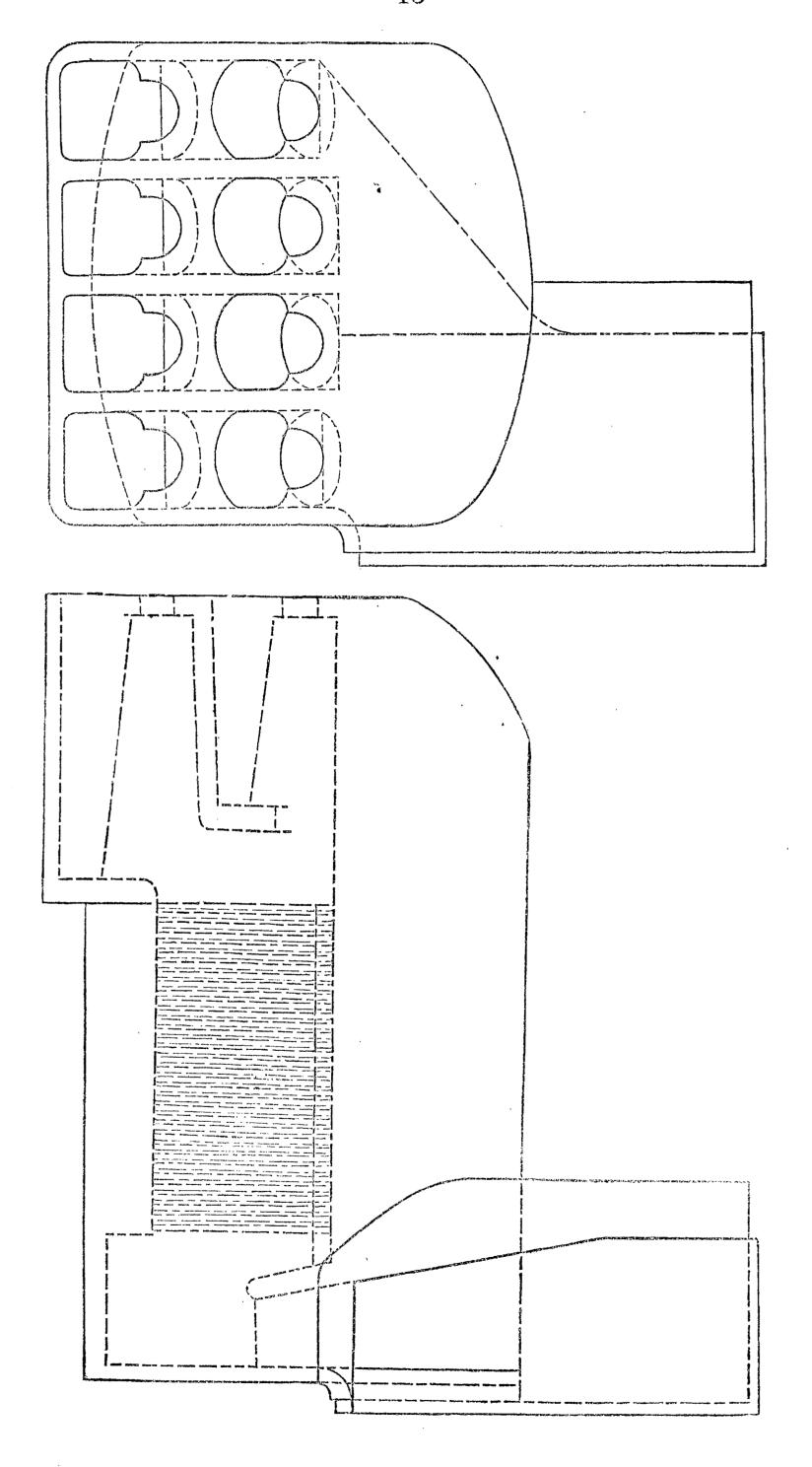
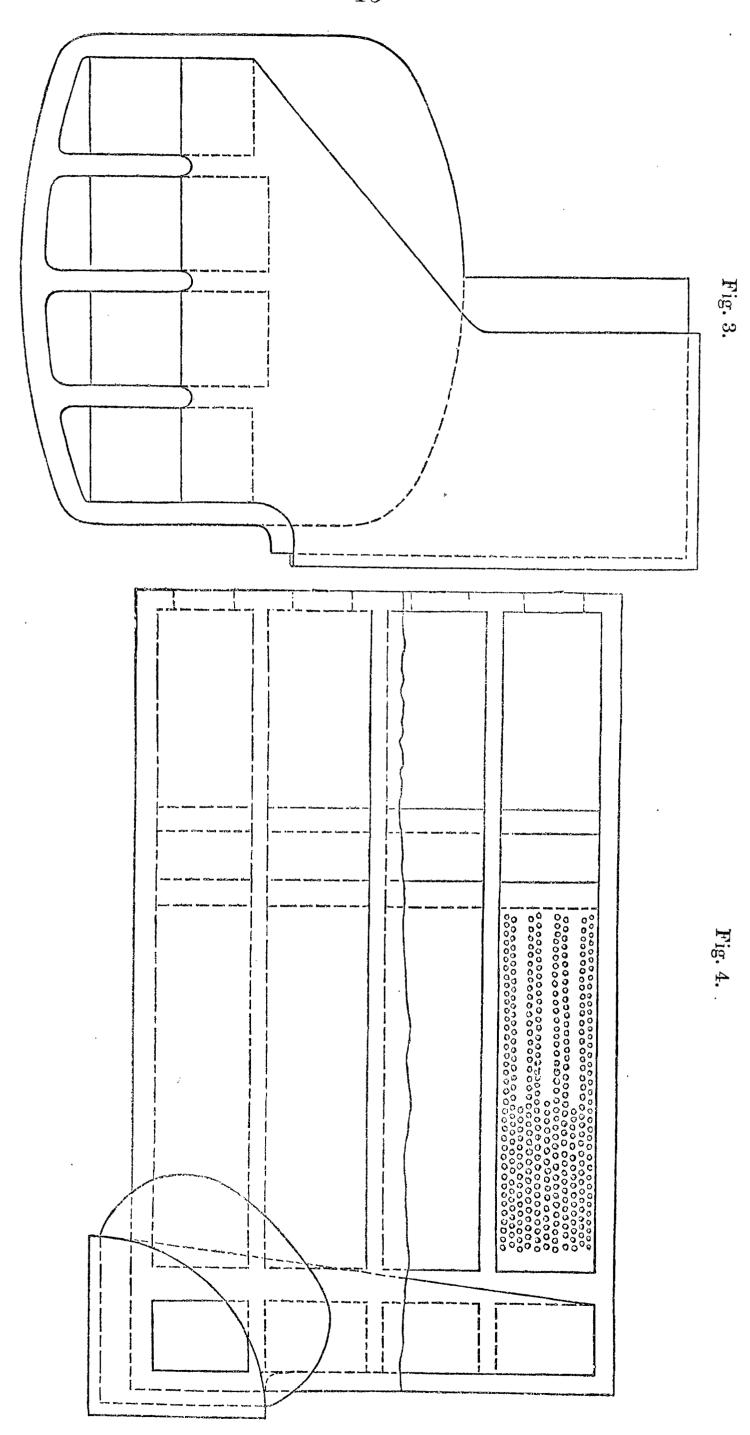


Fig. 3 shows a cross section of boiler at back connexion.

Fig. 4, plan of furnaces and tubes.



### PACIFIC.

Merchant Steamer running between New York and Liverpool. Engines designed and constructed by the Allaire Works, New York; boilers by John Faron, Esq., Chief Engineer of the Line.

	Feet.	Inches.
Length on Deck,	282	0
Breadth of Beam,	<b>4</b> 5	0
Depth of Hold, · ·	32	0
Tonnage, tons 2686		
Average Draft of Water,	19	0
Two Side Lever Engines.		
Diameter of Cylinders,	7	11
Length of Stroke,	9	0
Diameter of Paddle Wheels,	36	0
Length of Paddles,	11	8
Depth of "·····	2	2
Number of Paddles in each Wheel, . 28	3	
Average Dip of Wheel, · ·	7	0
Average Number of Revolutions, 13	~	
Average Pressure of Steam, . lbs. 14	<u>.</u>	
Cutting off at	4 .	. 0
Four Iron Boilers (back to back); tubes 2 in. diameter	er outsic	de.
vilote illibuit of I no learney	4 squar	
" Tube Surface, 13,560	J	
Grate Surface, 579	<b>~</b>	"
iddio of the Salidoo	$1\frac{1}{2}$ to 1.	
,	$3\frac{1}{4}$ to 1.	
Trica of space setting the	1 squar	
" at back,	$3\frac{1}{2}$	"
	$3\frac{1}{2}$	"
rieight of above crate,	5 feet.	
Combanipation of Branchista Company	0 lbs.	
Water Evaporated by 1 lb. of Coal,	$7\frac{1}{2}$ "	
Coal per hour to a square foot of Grate, 10	$\frac{3}{10}$	
•		

Boilers of the same size and kind as those of the Atlantic.

### BALTIC.

Merchant Steamer running between New York and Liverpool. Engines designed and constructed by the Allaire Works, New York; boilers by John Faron, Esq., Chief Engineer of the Line.

					Feet.	Inches.
Length on Deck,		•		•	283	6
Breadth of Beam,	ė		ó		45	0
Depth of Hold, .		•		. •	32	0
Tonnage,	•		ď	tons 2718		
Average Draft of Water,		ø		•	19	0
Two Side Lever Engines	•					
Diameter of Cylinders,		ó		•	7	11
Length of Stroke,	•		ė		10	0
Diameter of Paddle Whee	els,	ó		ó	36	0
Length of Paddles,	•		<b>é</b>		12	3
Depth of		•		•	2	3
Number of Paddles in each	ch W	heel,		32	,	
Average Dip of Wheel,		•		•	7	0
Average Number of Revo	olutio	ns,	•	13	$\frac{3}{4}$	
Average Pressure of Steam	m,	•		lbs. 14	:	
Cutting off at	•		•		4	6
Four Iron Boilers (back t	to bac	k); tub	es 2 in	ı. diamete	r outsid	le.
Whole Amount of Fire S	urface	Э,	đ	21,116	square	e feet.
"Tube	"		•	15,066		"
"Grate	"	•		635		"
Ratio of Fire Surface to o	cubic	foot of	Cylind	der, 21	$\frac{1}{2}$ to 1.	
(	Grate	Surface	e <b>,</b>	33	$\frac{1}{4}$ to 1.	ı
Area of space between tu	ibes i	n front,		122	squar	e feet.
66 66 66	" a	it back,		81	_	"
" Chimney,	•		•	63	<u>1</u> .	"
Height of " above 6	irate,	•		<b>7</b> 5	feet.	
Consumption of Bitumine	ous C	oal per	hour,	6615	lbs.	
Water Evaporated by 1		-	·	7	$\frac{1}{2}$ lbs.	
Coal per hour to a square		-	e,		3 (( 10	

Boilers of the same kind as the Atlantic's, but wider, and containing one-ninth more fire surface.

### ARCTIC.

Merchant Steamer running between New York and Liverpool. Engines designed and constructed by Stillman, Allen & Co., New York; boilers by John Faron, Esq.,\* Chief Engineer of the Line.

		<b>377</b> .	• •
Length on Deck,		Feet. 286	Inches.
Breadth of Beam,	•	45	8
Depth of Hold, .		32	0
Tonnage,	tons 2772		U
Average Draft of Water,	tons 2112		0
Two Side Lever Engines.	a	19	U
\.\frac{\pi}{\pi}		<b>F</b> ab•	
Diameter of Cylinders,  Langth of Studies		7	11
Length of Stroke,	•	10	0
Diameter of Paddle Wheels,		35	6
Length of Paddles, .	6	12	2
Depth of		2	2
Number of Paddles in each Wheel,	. 36	5	
Average Dip of Wheel,		7	5
Average Number of Revolutions,	. 18	3 <b>3</b>	
Average Pressure of Steam,	lbs. 14	•	
Cutting off at		4.	6
Four Iron Boilers (back to back); tubes 2	in diamete	r Autsid	
Whole Amount of Fire Surface, .			
"Tube"		) squar	e leet.
"Grate".	15,066		"
Ratio of Fire Surface to cubic foot of Cyli	. 638		
	*	$\frac{1}{2}$ to 1.	
Grate Bullace,	. 33	_	
Area of space between tubes in front,	122	2 squar	e feet.
at back,	81	•	66
" Chimney, .	63	$\frac{1}{2}$	66
Height of "above Grate,	. 75	feet.	
Consumption of Bituminous Coal per hour	, 6615	lbs.	
Water Evaporated by 1 lb. of Coal,		$\frac{1}{2}$ lbs.	
Coal per hour to a square foot of Grate,		3 66	
	10	10	

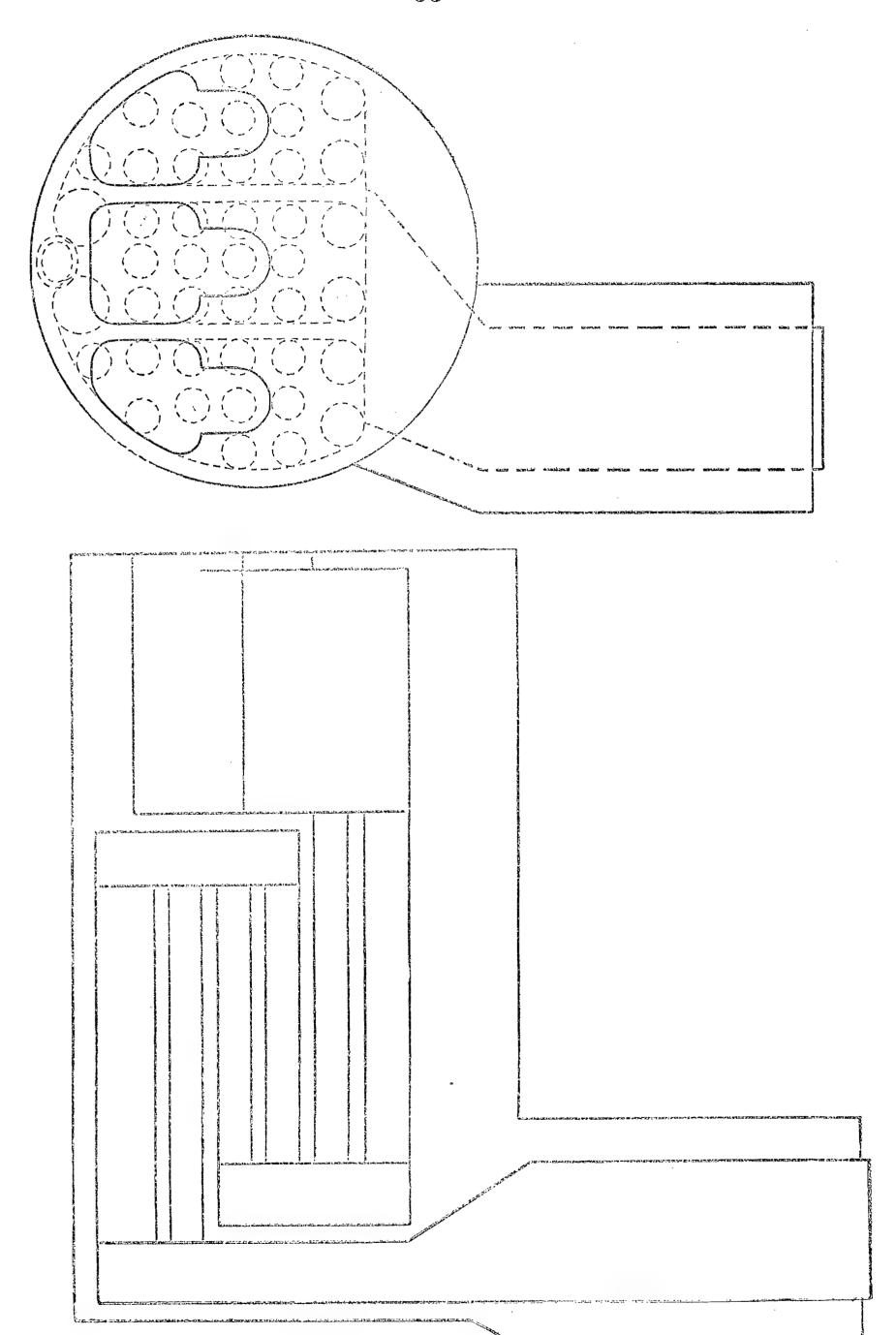
<sup>\*</sup> Since deceased.

Boilers same as the Baltic's.

### FRANKLIN.

Merchant Steamer running between New York and Havre. Engines and Boilers designed and constructed by Stillman, Allen & Co., New York.

			Feet.	Inches.
Length on Deck,	o		263	0
Breadth of Beam, .		•	41	10
Depth of Hold, .	o		26	O
Tonnage,		tons 24	10	
Average Draft of Water,	•		18	0
Two Side Lever Engines.				
Diameter of Cylinders,	e		7	9
Length of Stroke, .		G	8	0
Diameter of Paddle Wheels,	q		32	2
Length of Paddles, .		ø	11	8
Depth of "·	o		2	0
Number of Paddles in each Wheel,			28	
Average Dip of Wheel,		<b>ઝ</b>	6	9
Average Number of Revolutions,	v.		13	
Average Pressure of Steam, .		lbs.	15	
Cutting off at .	ø		3	O
Four Iron Boilers (back to back).				
Whole Amount of Fire Surface,	•	85	528 squa	re feet.
Grate ".		3	00	66
Ratio of Fire Surface to cubic foot	of Cyline	der,	$11_{\frac{3}{10}}$ to	1.
Grate Surf	ace,		$28_{10}^{4}$ to	1.
Area of 1st Flues, .		0	57 squar	re feet.
" 2d " .	o		46	66
ee 3d ee		•	$43\frac{1}{2}$	66
Chimney, .	•		50	66
Height of "above Grate,		•	63 feet.	
Consumption of Bituminous Coal p	er hour	,	3160 lbs.	•
Water Evaporated by 1 lb. of Coal	,		5 lbs.	
Coal per hour to a square foot of G	irate,		$20\frac{1}{2}$ "	

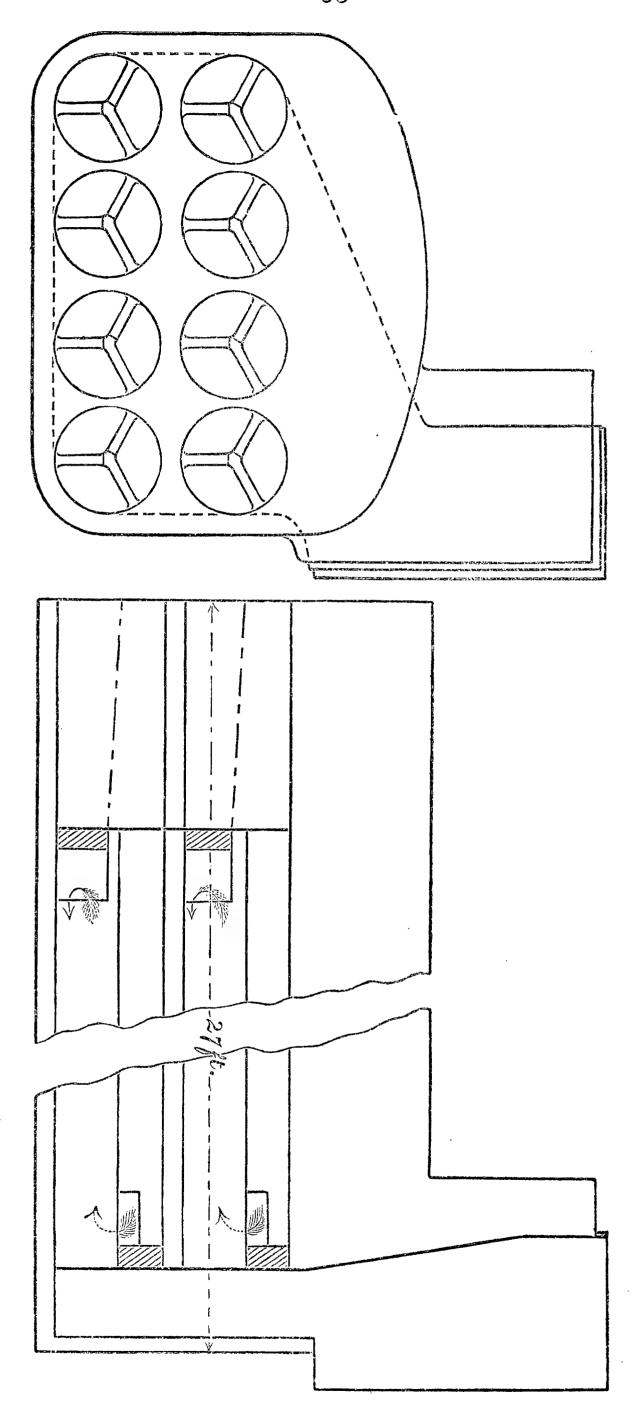


### **HUMBOLDT.\***

Merchant Steamer running between New York and Havre. Engines and Boilers designed and constructed by Stillman, Allen & Co., New York.

		Feet.	Inches.
Length on Deck,		284	0
Breadth of Beam,	٨	46	o
Depth of Hold,	·	27	Ö
Tonnage, .	tons 2856	,	•
	estimated)	19	3
Two Side Lever Engines.	,	C	
Diameter of Cylinders, .		7	11
Length of Stroke,	<b>A</b>	9	0
Diameter of Paddle Wheels,	•	34	<b>2</b>
Length of Paddles.	•	12	3
Depth of "	•	2	2
Number of Paddles in each Wheel,	. 36	,	7.5
	(estimated)	8	0
Average Number of Revolutions,	" 14		J
Average Pressure of Steam,	" lbs. 15		
Cutting off at .	•	4	0
Four Iron Boilers (back to back).		_	Ü
Whole Amount of Fire Surface,	11,332	sauare	feet.
" Grate "	608	6	
Ratio of Fire Surface to cubic foot of Cylin	_	$\frac{3}{0}$ to 1	•
"Grate Surface,	•	$\frac{1}{0}$ to $1$	
Area of 1st, 2d, and 3d Flues, each	•	square	
" Chimney, .	$56\frac{1}{3}$	_	
Height of "above Grate,	~	feet.	
Consumption of Bituminous Coal per hour,			
Water Evaporated by 1 lb. of Coal,	7		
Coal per hour to a square foot of Grate,	$10\frac{1}{9}$	. 66	
Note.—The consumption of Fuel is estimat	Ad		4
18 estimation of Lagins estimat	eu from the	e trial	trip.

<sup>\*</sup> Now on her first passage.



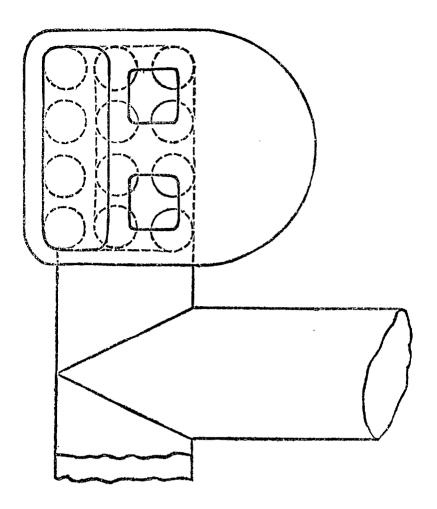
#### OSPREY.

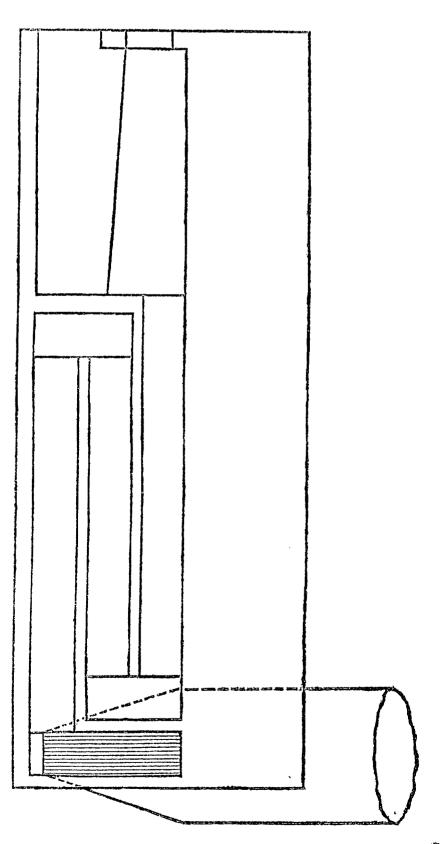
Merchant Steamer running between Philadelphia and Charleston. Engine and Boilers designed and constructed at the West Point Foundry.

					Feet.	Inches.
Length on Deck,	9		•		145	0
Breadth of Beam,		•		4	27	0
Depth of Hold,	•		ė		11	0
Tonnage, .		e		tons 388	1	
Average Draft of Water	,		•		10	
One Steeple Engine.						
Diameter of Cylinder,		•		q	4	6
Length of Stroke,	•		•		6	0
Diameter of Paddle Wh	neels,	•		•	23	0
Length of Paddles,	•		•		6	0
Depth of "		•	14 inche	es each, or	2	4
Number of Double Pad	dles in	each	Wheel,	20	•	
Average Dip of Wheel,			Ð		3	6
Average Number of Re	volutio	ns,		. 16	) 	
Average Pressure of Sto	eam,		•	lbs. 18	· ·	
Cutting off at .		•		•	3	9
Two Iron Boilers (one e	each sid	de of	engine).		•	
Whole Amount of Fire	Surfac	e,	•	1420	square	e feet.
" Grate	e Surfa	ce,		80	(	4
Ratio of Fire Surface to	cubic	foot	of Cylind	er, 14	$\frac{8}{10}$ to 1	. •
(( (( ((	Grate	Surfa	ace,	17	$\frac{6}{10}$ to 1	•
Area of 1st, 2d, and 3d	Flues	, eacl	n	. 9	$\frac{8}{10}$ squ	are feet.
" Chimney,	•		٥	10	$\frac{1}{2}$	"
Height of "abov	e Grate	Э,		. 40	feet.	
Consumption of Anthra	cite Co	al pe	er hour,*	1680	lbs.	
Water Evaporated by 1	lb. of	Coal	,	5	$\frac{15}{100}$ lb	S.
Coal per hour to a squa	are foot	of G	irate,	. 2	21 "	

<sup>\*</sup> Fan blast under grate.







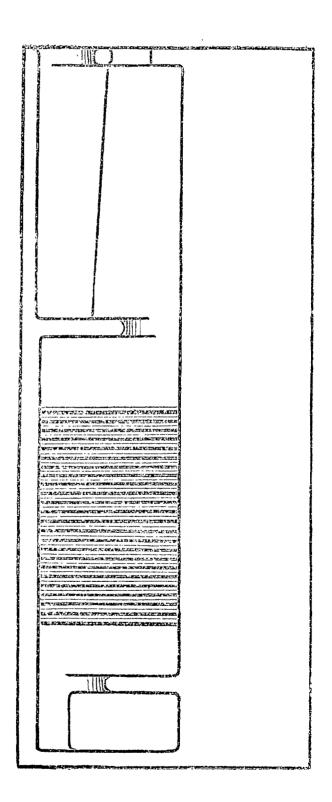
#### OSPREY.\*

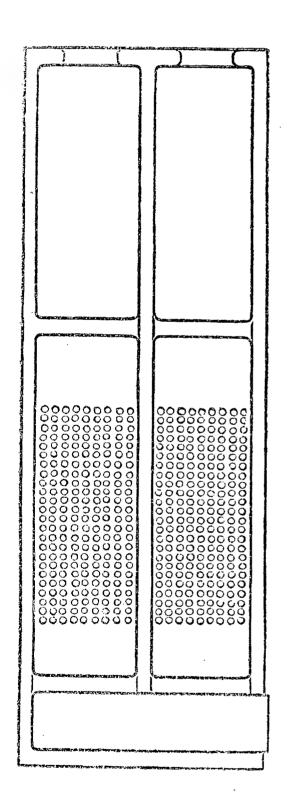
Merchant Steamer running between Philadelphia and Charleston. Engine designed and constructed at the West Point Foundry; boilers by Merrick & Son, Philadelphia.

			Feet.	Inches.
Length on Deck,	9		175	0
Breadth of Beam,	•	•	27	0
Depth of Hold,	a		18	0
Tonnage, .		tons 610		
Average Draft of Water,	o		9	6
One Steeple Engine.				
Diameter of Cylinder, .		ø	4	6
Length of Stroke, .	s		6	0
Diameter of Paddle Wheels, .		ø	24	6
Length of Paddles, .	•		6	O
Depth of "·	14 inches	s each, or	2	4
Number of Paddles in each Wheel,		20		
Average Dip of Wheel,	o		3	6
Average Number of Revolutions,		. 15	)	
Average Pressure of Steam,	ø	lbs. 20		
Cutting off at		•	3	9
Two Iron Boilers (one each side of	engine);	tubes 2	in. out	side dia'r.
Whole Amount of Fire Surface,	•	2632	square	e feet.
" Tube Surface,		1766	•	66
"Grate Surface,		77	<b>'</b>	66
Ratio of Fire Surface to cubic foot	of Cylind	er, 27	$7\frac{1}{2}$ to 1.	
" Grate Surf	face,	34	to 1.	•
Area of space between Tubes,		. 18	3 squar	re feet.
"Chimney, .	•	1	$0\frac{1}{2}$	"
Height of " above Grate,	•	. 40	) feet.	
Consumption of Anthracite Coal p	er hour,†	1284	lbs.	
Water Evaporated by 1 lb. of Coa	1,	,	7 lbs.	
Coal per hour to a square footof (	Grate,	1	16 6 "	

<sup>\*</sup> With increased hull, new boilers, and Pirsson's fresh water condenser. About  $\frac{1}{8}$ th of the usual quantity of water is blown out, to prevent the accumulation of oil in the boiler.

<sup>†</sup> With fan blast under grate.



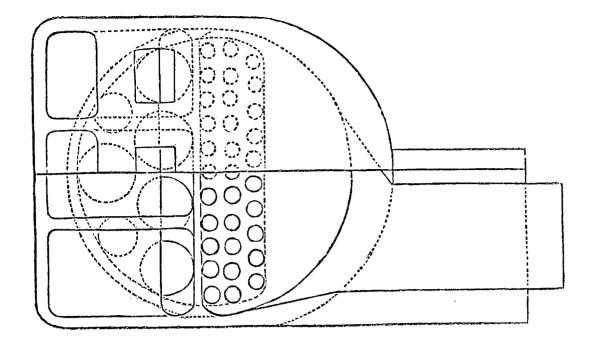


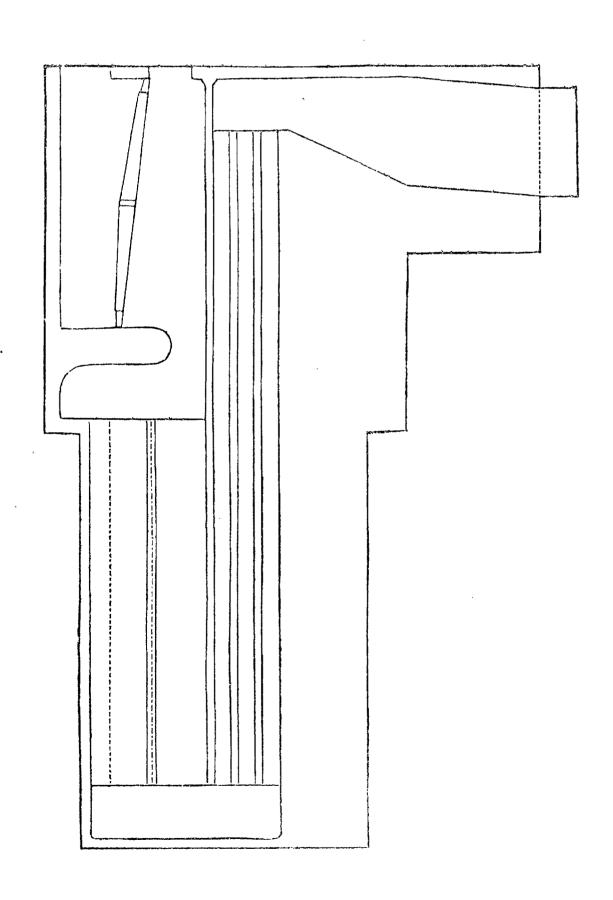
#### **ALBATROSS.\***

Merchant Steamer running between Philadelphia and Charleston. Exgines and boilers designed and constructed by James T. Sutton & Co. Philadelphia.

				Feet.	Inches.	
Length on Deck,	۵		٠	171	0	
Breadth of Beam,		3		27	4.	
Depth of Hold, .	0		o	19	0	
Tonnage,		9	tons 6	10		
Average Draft of Water,	9		٠	10	6	
Two Oscillating Engines.						
Diameter of Cylinders,	•		G	3	4	
Length of Stroke,		•		3	4	
Diameter of Propeller,	•		s	10	O	
Length of do		ø		4	6	
Angle at Hub, .	ø		d) here-	rentad		
" Periphery, .		•	50	0		
Pitch at "	٥		9	26	6	
Number of Blades,		•		4		
Area of	. 8	. 84 square feet.				
Average Number of Revo	lutions of	Engines,	3	32		
66 66 66	"	Propeller	, 5	66		
" Pressure of Steam,	•		lbs. 2	23		
Cutting off at .		•		1 f	t. 8 in.	
Two Iron Boilers (side by	$\operatorname{side},)$		•			
Whole Amount of Fire Su	rface,	•	3334 square feet.			
" Grate			•	102	66	
Ratio of Fire Surface to cu	bic foot o	f Cylinder	,	$57\frac{1}{4}$ to	1.	
" " G	rate Surfa	ice,		$32\frac{3}{4}$ to	1.	
Area of 1st Flues, .		•		$11\frac{3}{4}$ squ	are feet.	
" 2d "	ن		•	$12\frac{6}{10}$	66	
" Chimney, .		•		14	"	
Height of " above 6	Frate,		•	45 feet.		
Consumption of Anthracite	16	880 lbs.	•			
Water Evaporated by 1 lb		5 8 "				
Coal per hour to a square	6	161 "				

<sup>\*</sup> With Pirsson's Fresh Water Condenser.



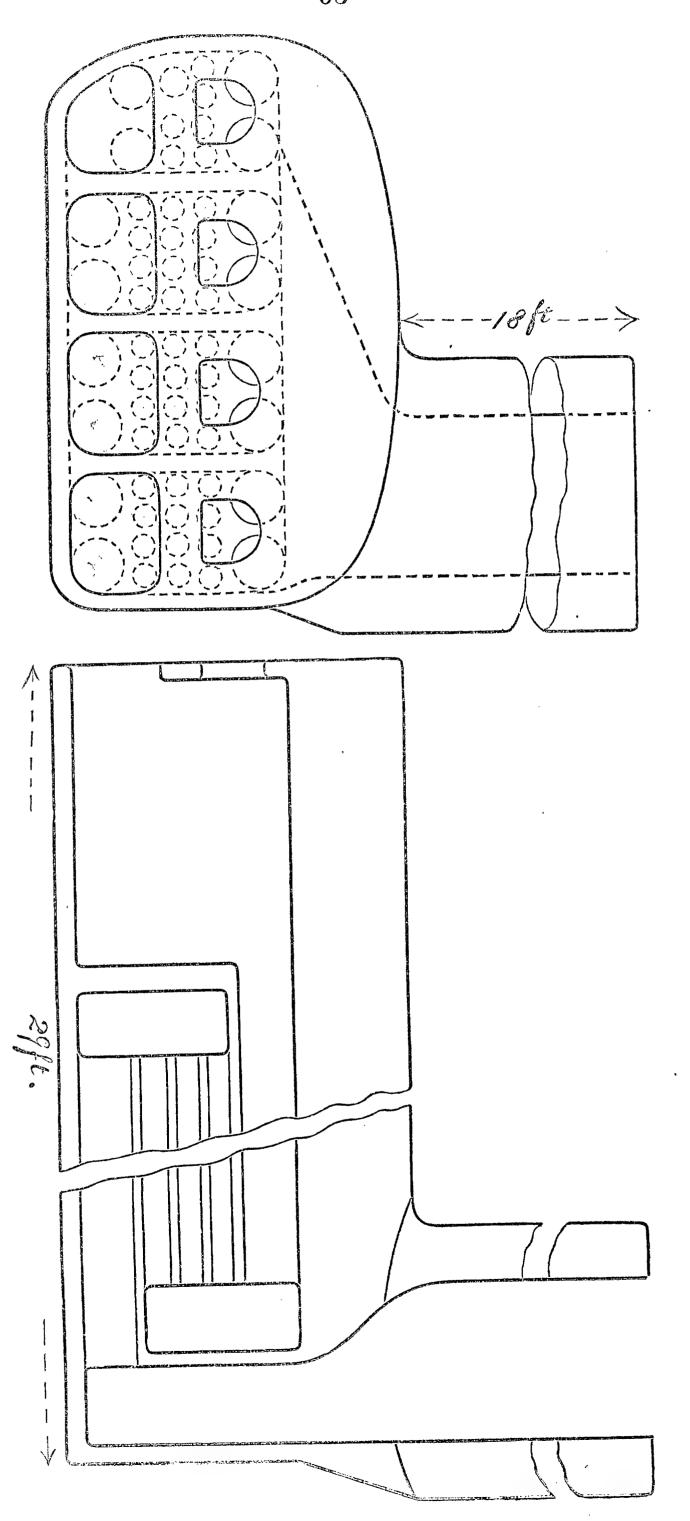


## PIONEER.\*

Merchant Steamer to run between New York and Liverpool. Engines and Boilers, designed and constructed at the West Point Foundry.

3. 12 A.	ਚ						Feet.	Inches.
Length on Dec	•	9		•			230	O
Breadth of Bea	•		•		σ		42	0
Depth of Hold,	)	٠		•			31	0
Tonnage,	•		•		tons 1	1903		
Average Draft		•	,				19	0
Two Vertical I			runk E	Ingines	(Cylin	ders	over C	ranks).
Diameter of Cy	•			•			7	$rac{1}{2}$
	runks,		•		•		3	3
Length of Strol	•	٠		٠			4	3
Diameter of Pr	opeller,		•		s		16	O
Length of	66	a		o			5	O
Angle at Hub,	_		•		o	$17^{\circ}$		
" Peripl	hery,					56°		
Pitch at Hub,		o		9			<b>27</b>	6
"at Periph	• ,		ó		ø		34	0
Number of Blac	des,		•		•	3		
Area		ø		•		108 s	square	feet.
Average Numb			ns, (es	stimated	.)	35		
Average Pressu	re of Ste	eam,		66	lbs	. 15		
Cutting off at			ø		•		2	$1\frac{1}{2}$
Two Iron Boile	•	•	,					_
Whole Amount	of Fire	Surface	е,	٥	7	279 s	square	feet.
66 66	Grat		۰			217	66	
Ratio of Fire S	urface to	cubic	foot of	Cylinde	er,	28 t	o 1.	
66 66	66	Grate	Surfac	e,		$33\frac{1}{2}$	to 1.	
Area of 1st Flu	es,	•		8		$29  \mathrm{s}$	quare	feet.
" 2d "			•		6	$30_{\frac{4}{1}}$		
" 3d "		6		•		$27\frac{1}{4}$	66	
" Chimne	ey,	•	œ.			32	66	
Height of "	above C	Frate,		b		59 f	eet.	6
Consumption of	f Bitumi	nous Co	oal per	hour,		Company of the last of the las		
Coal per hour t						<del>Constructions</del>		
				-				

<sup>\*</sup> Not yet finished.

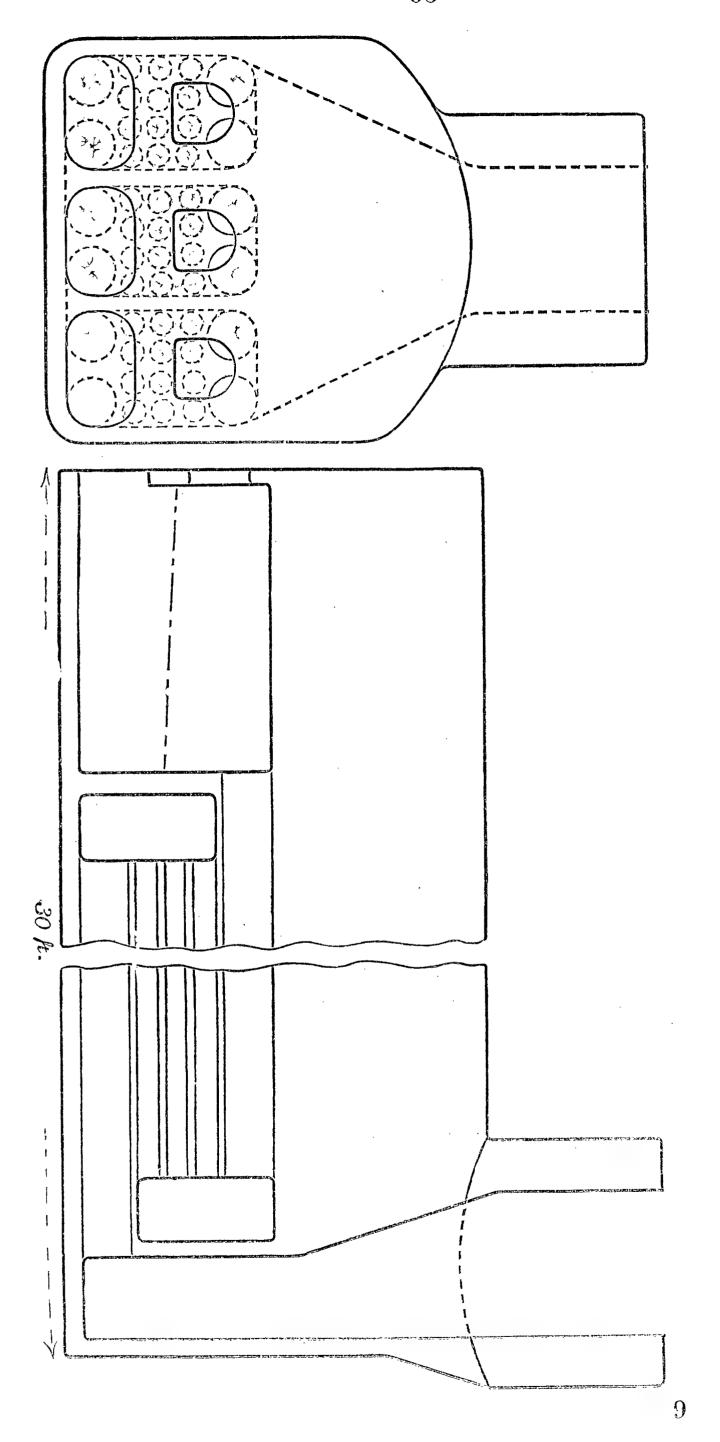


## CITY OF PITTSBURGH.\*

Merchant Steamer to run between Philadelphia and Liverpool. Engines and boilers designed and constructed at the West Point Foundry.

						Feet.	Inches.
Length on Deck,	•			_		245	0
Breadth of Beam,		•		•		38	0
Depth of Hold, .	•		•			33	0
Tonnage,	_	•		tons 16	372	00	V
Average Draft of Wate	r. (esti	mated)	•		<i>,</i> , ~	18	0
Two Vertical Direct Ac			oines	· (Cylind	erg		•
Diameter of Cylinders,		- COLLEGE	811100	Cymre	CIB	7	7
"Trunks,			•			3	$\frac{1}{2}$
Length of Stroke,	•	G	_	•		4	3
Diameter of Propeller,	·		•			16	0
Length of		•	_	•		5	o
Angle at Hub, .			•	•	16°	_	Ü
" Periphery,	•	•	6	S	54°		
Pitch at Hub,		•		۵		29 ft.	6 in.
" Periphery,	ø		•	·		36	0
Number of Blades,		ø		, G	3		
Area "	•		<b>s</b>	1	_	square	feet.
Average Number of Re	evolutio	ons, (est	imated		35	7	
" Pressure of Ste			66	lbs.			
Cutting off at .	•	•		•		2	$1\frac{1}{2}$ .
Three Iron Boilers (side	e by sid	de,)					<b>2</b> 2
Whole Amount of Fire			•	80	028	square	feet.
" Grate		•			226	66	
Ratio of Fire Surface to	cubic	foot of	Cylind	ler.	30-	9 to 1	•
		Surface				to 1.	
Area of 1st Flues,					_		re feet.
" 2d "		•			37 6	_	"
" 3d "	•		•		$28_{1}^{4}$	·	66
"Chimney,		•			$37\frac{1}{16}$	•	66
Height of " above	Grate,		O		_	6 in.	
Consumption of Coal pe	r hour.	,		tmu	the garge		,
Water Evaporated by 1							
α , , , , , , , , , , , , , , , , , , ,	10. OI	Coal,		9 -			
Coal per hour to a square	re foot	of Grate	<b>3</b> ,	g team			

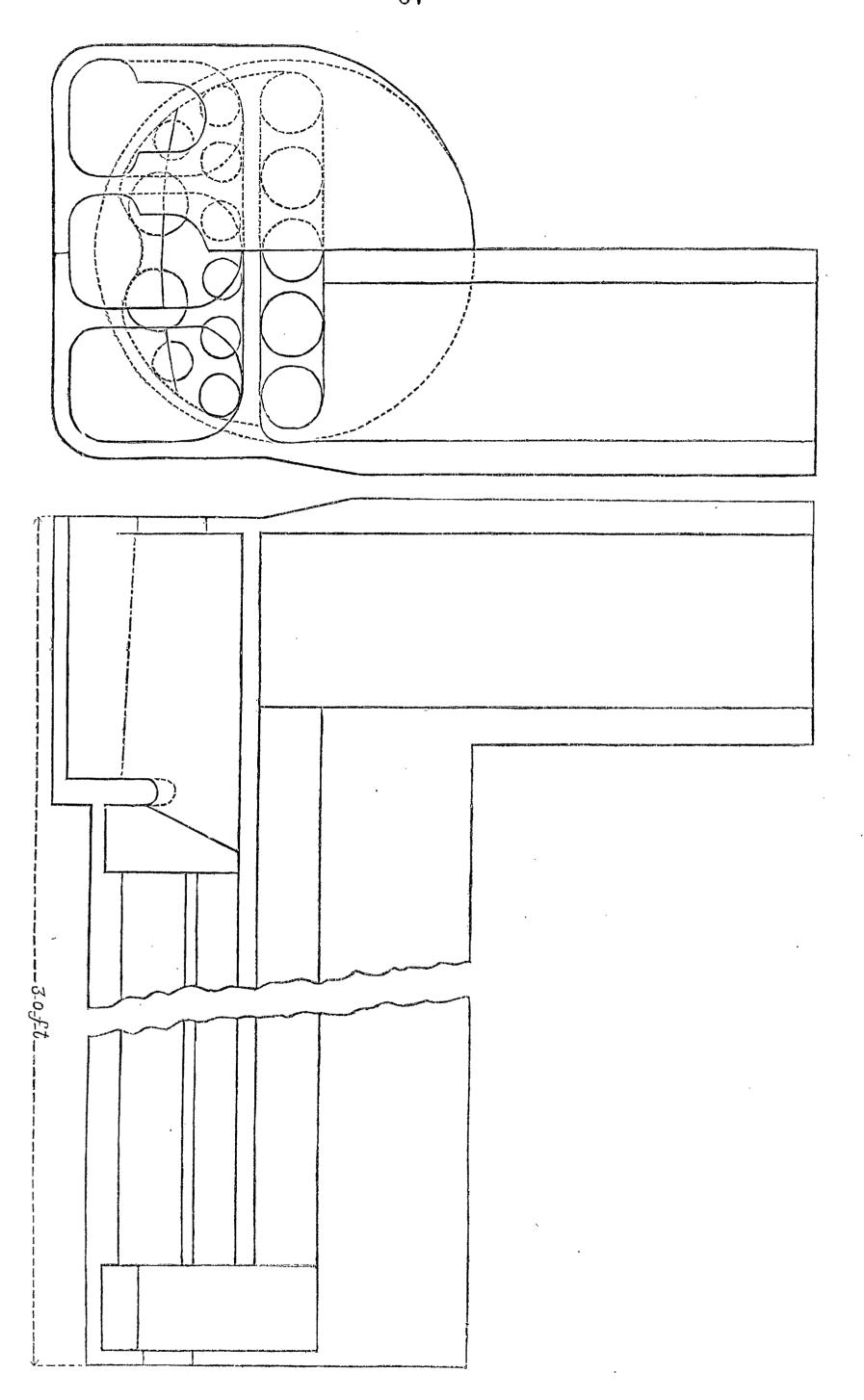
<sup>\*</sup> Not yet Finished.



### EL DORADO.

Merchant Steamer running from New Orleans to Chagres. Engines and Boilers designed and constructed by Cunningham, Belknap & Co., New York.

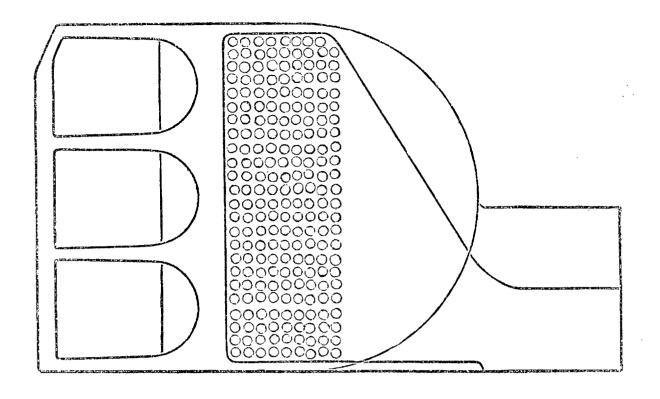
			Feet.	Inches.
Length on Deck, .	•		235	0
Breadth of Beam, .		•	31	0
Depth of Hold, .	•		23	0
Tonnage,		tons 1092	2	
Average Draft of Water,	•		12	0
Two Beam Engines.				
Diameter of Cylinders, .	σ		4	2
Length of Stroke, .		•	10	
Diameter of Paddle Wheels,	•		29	4
Length of Paddles, .		•	8	10
Depth of ".	•		2	0
Number of Paddles in each Wheel,		. 30	)	
Average Dip of Wheel,	•		5	0
Average Number of Revolutions,		16	3	
Average Pressure of Steam,	•	"lbs. 10	)	
Cutting off at		•	5	0
Two Iron Boilers (side by side)				
Whole Amount of Fire Surface,	•	3838	3 square	e feet.
" Grate "		143	3	6
Ratio of Fire Surface to cubic foot of	Cylin	nder, 14	to 1.	
" Grate Surface	<del>)</del> ,	26	$\frac{8}{10}$ to 1	•
Area of 1st Flues, .		. 28	square	feet.
" 2d " .	•	26	$\frac{4}{10}$	"
" Chimney, .		. 32	;	6
Height of "above Grate,	•	59	) feet.	
Consumption of Bituminous Coal per	hour,	2500	lbs.	
Water Evaporated by 1 lb. of Coal,		6	$\frac{1}{4}$ lbs.	
Coal per hour to a square foot of Grat	æ,	17	4 66	

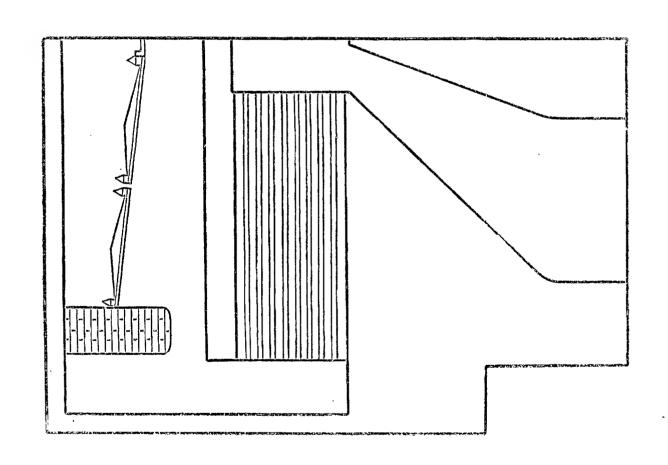


### MONUMENTAL CITY.

Merchant Steamer running from Panama to San Francisco. Engines and boilers designed and constructed by Murry & Hazlehurst, Baltimore.

		Feet.	Inches.
Length on Deck, .	•	180	0
Breadth of Beam,		30	0
Depth of Hold, .	•	15	0
Tonnage,	tons	768	
Average Draft of Water, .	•	12	0
Two Oscillating Engines (direct action).			
Diameter of Cylinders, .	•	3	8
Length of Stroke,		3	0
Diameter of Propeller, .	•	12	0
Length of "		3	0
Angle at Hub,	• •	10°	
" at Periphery,	į	55 <del>1</del> 0	
Pitch at ".	•	25	0
Number of Blades,		4	
Area of "·		$54_{10}^4~{ m sgr}$	uare feet.
Average Number of Revolutions, .		40	
Average Pressure of Steam, .	lbs.	15	
Cutting off at		2	0
Two Iron Boilers (side by side).			
Whole Amount of Fire Surface,	32	230 squa	re feet.
"Tube".	28	520	"
"Grate".		102	"
Ratio of Fire Surface to cubic foot of Cylinder,		51 to	1.
" Grate Surface		$31\frac{1}{2}$ to	1.
Area of Tubes, .	<b>,</b>	21 squa	are feet.
" Chimney,		16	
Height of "above Grate,	<b>.</b>	49 ft. 7	in.
Consumption of Bituminous Coal per hour,	1	680 lbs	•
Water Evaporated by 1 lb. of Coal, .		8	4
Coal per hour to a square foot of Grate,		$16\frac{5}{10}$	ć

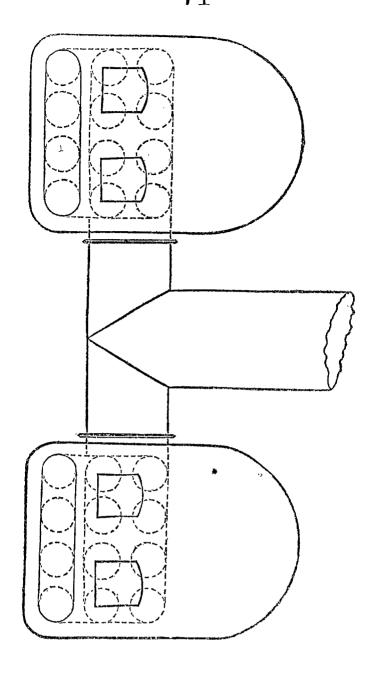


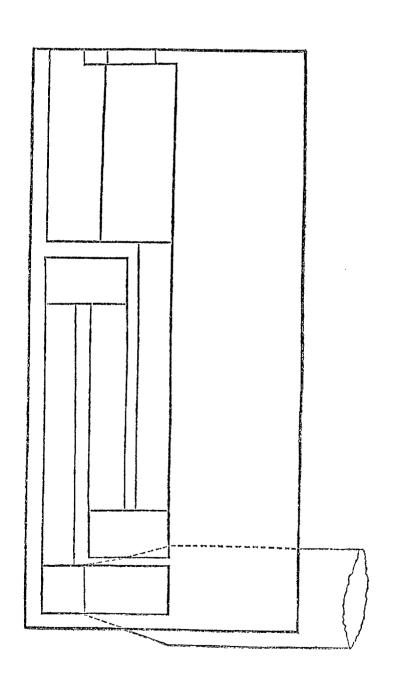


## VIXEN.

War Steamer belonging to the United States Navy. Engine and boilers designed and built by the West Point Foundry.

	Feet.	Inches.
Length on Deck,	118	0
Breadth of Beam,	22	6
Depth of Hold,	9	3
Tonnage, . tons	s 234	
Average Draft of Water,	7	0
One Horizontal Half Beam Engine (Lighthall's p	atent).	
Diameter of Cylinder,	3	0
Length of Stroke,	6	0
Diameter of Paddle Wheels,	18	6
Length of Paddles,	6	3
Depth of "	1	9
Number of Paddles in each Wheel,	14	
Average Dip of Wheel, .	. 3	0
Average Number of Revolutions, .	15	
Average Pressure of Steam, . lb	s. 15	
Cutting off at	3	0
Two Iron Boilers (one each side of engine).		
Whole Amount of Fire Surface, .	756 square	e feet.
"Grate".	47	"
Ratio of Fire Surface to cubic foot of Cylinder,	18 to 1.	
"Grate Surface,	16 to 1.	
Area of 1st, 2d, and 3d Flues, each	$6\frac{3}{10}$ squ	are feet.
Chimney,	$6\frac{3}{10}$	"
Height of "above Grate, .	43 ft. 9 i	n.
Consumption of Bituminous Coal per hour,	600 lbs.	
Water Evaporated by 1 lb. of Coal,	$4\frac{1}{2}$ lbs.	
Coal per hour to a square foot of Grate,	$12ar{rac{3}{4}}$ "	



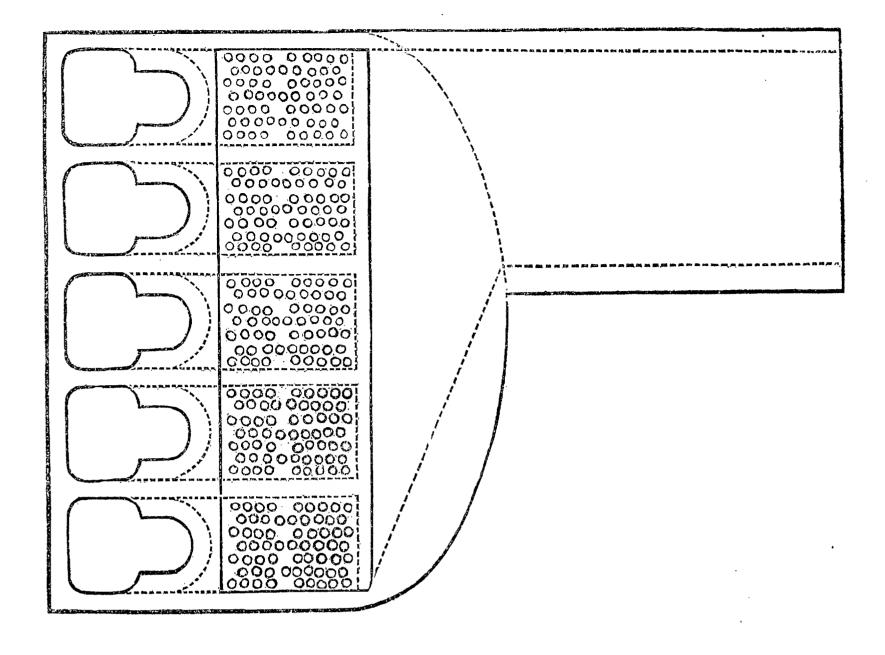


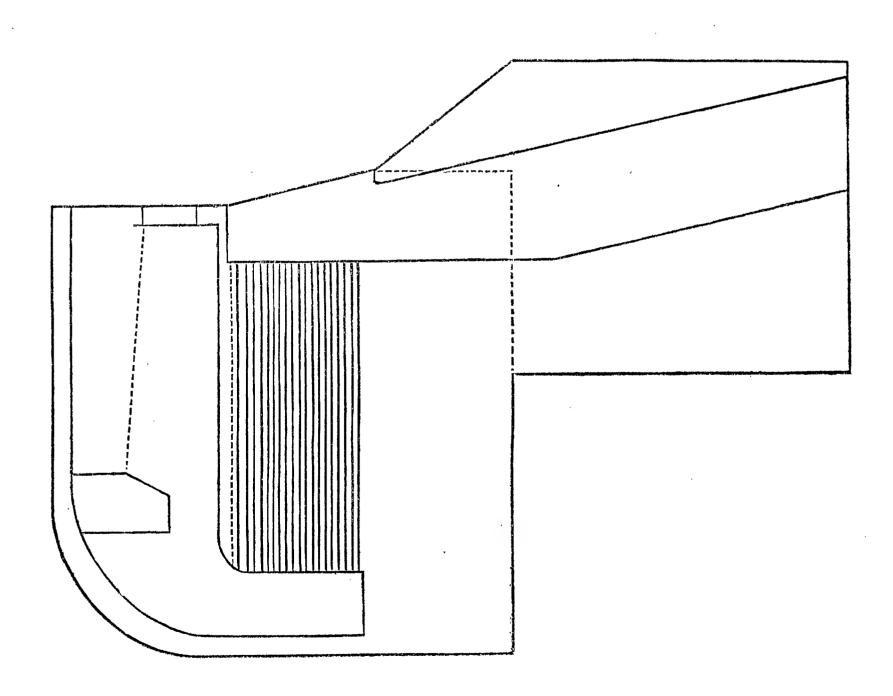
## GOLDEN GATE.\*

Merchant Steamer to run from San Francisco to Panama. Engines designed and constructed by Stillman Allen & Co., New York.

	Feet.	Inches.
Length on Deck,	265	0
Breadth of Beam,	40	0
Depth of Hold,	22	0
Tonnage, tons 20	30	
Average Draft of Water, (estimated) .	17	6
Two Oscillating Engines.		
Diameter of Cylinders,	7	1
Length of Stroke,	9	0
Diameter of Paddle Wheels, : .	32	0
Length of Paddles,	11	0
Depth of "·	2	4
Number of Paddles in each Wheel,	30	
Average Dip of Wheel, (estimated) .	6	0
Average Number of Revolutions, .	gamentus-mass sens	
Average Pressure of Steam, .	<del></del>	
Cutting off at	·	
Four Iron Boilers, two aft and two forward of eng	ines, two	chimnies.
Whole Amount of Fire Surface, . 12,	$052~{ m square}$	e feet.
"Tube Surface, tubes 3 ins. bore 8	396 '	6
"Grate Surface,	367 '	(
Ratio of Fire Surface to cubic foot of Cylinder,	17 to 1.	
" " Grate Surface, .	$32\frac{s}{10}$ to 1	l.
Area of tubes	$61\frac{3}{4}$ squa	re feet.
"Chimnies, .	<b>57</b>	<b>6</b> 6
Height of "above Grate, .	60 feet.	
Consumption of Bituminous Coal per hour,		
Water Evaporated by 1 lb. of Coal,		
Coal per hour to a square foot of Grate,		

<sup>\*</sup> Finished but not yet made a trial trip.



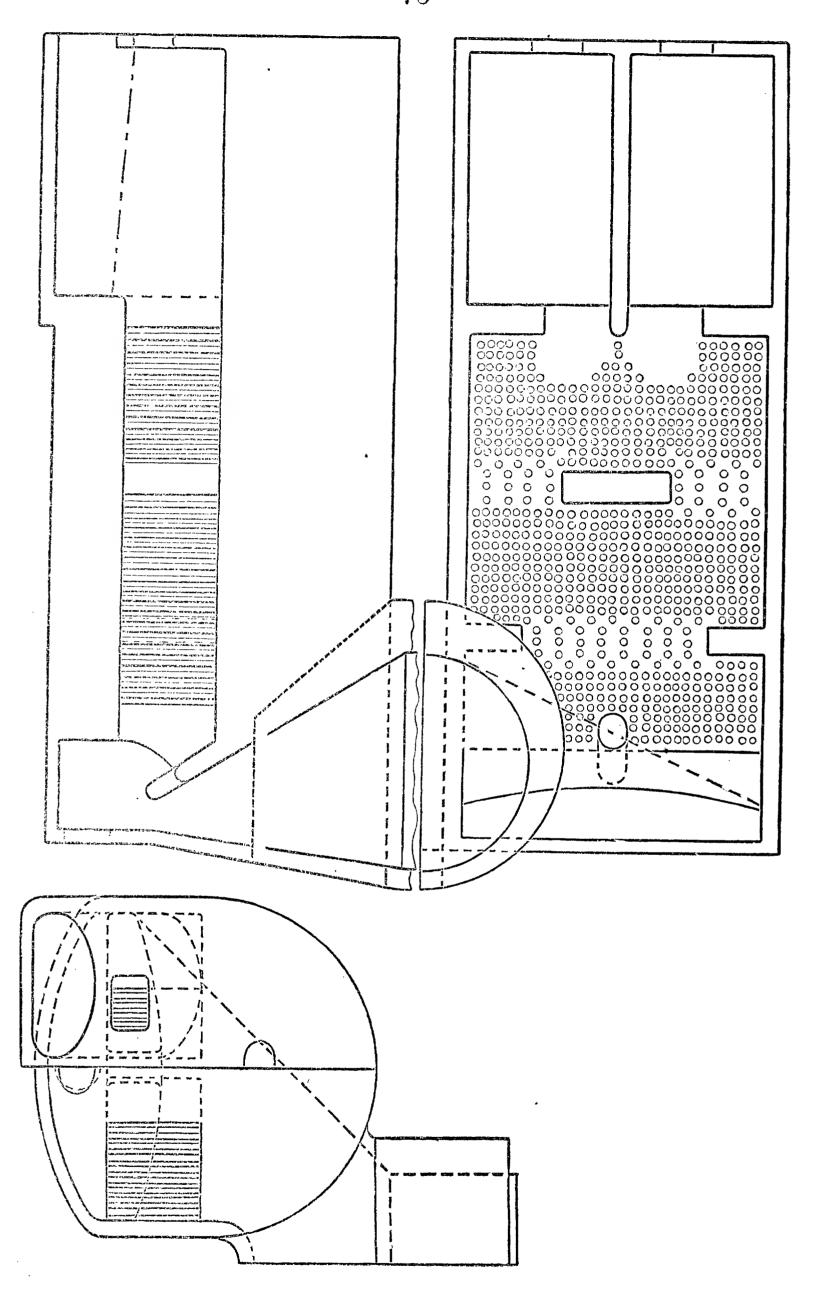


### CONSTITUTION.

Merchant Steamer running between Panama and San Francisco. Engines designed and constructed by I. P. Morris & Co., of Philadelphia; boilers by R. F. Loper, Esq., and constructed by I. P. Morris & Co.

·					Feet.	Inches.
Length on Deck,	•		e		165	0
Breadth of Beam,		•		•	25	4
Depth of Hold,	•		•		17	0
Tonnage, .		•		tons 40	37	
Average Draft of Wate	er,		•		11	0
Two Direct Action En	igines,	Cylind	lers abov	e Crank	S.	
Diameter of Cylinders,		•		•	2	10
Length of Stroke,			•		2	10
Diameter of Propeller,		•		Þ	10	4
Length of	•		6		4	7
Angle at Hub,					30°	
" at Periphery,	•		o	4	45°	
Pitch at		•		٥	32	$5\frac{1}{4}$
Number of Blades,	¢				3	*
Area of "		•		. 6	$88\frac{1}{4}$ squar	e feet.
Average Number of R	evoluti	ons,			40	
Average Pressure of S	team,		•	lbs. 3	32	
Cutting off at .		•		•	1	9
Two Iron Boilers; tube	es 2 in.	outsid	le diame	ter.		
Whole Amount of Fire	e Surfa	ce,	•	331	6 square	feet.
" Tub	e Surf	ace,		218	88 - "	4
" Gran	te Surf	ace,		9	6	4
Ratio of Fire Surface t	o cubi	c foot c	of Cylind	er, 9	3 to 1.	
"		e Surfa	•	•	$4\frac{1}{9}$ to 1.	
Area of space between	Tubes	s,	·		20 square	e feet.
" Chimney,	•		•		$19_{10}^{6}$	66
Height of "above	re Gra	te,			l6 feet.	
Consumption of Anthra	acite C	oal per	hour,*	Mattheway	- lbs.	
Water Evaporated by					lbs.	
Coal per hour to a squ		-			restrigation 6.6	

<sup>\*</sup> No authentic account of fuel consumed.

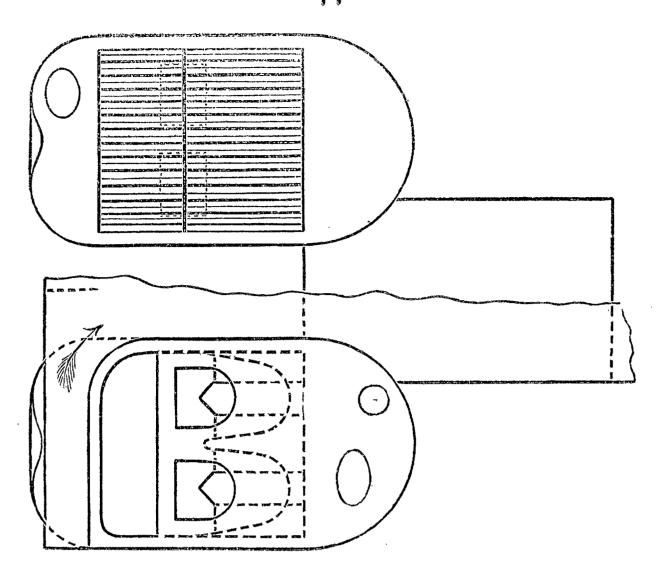


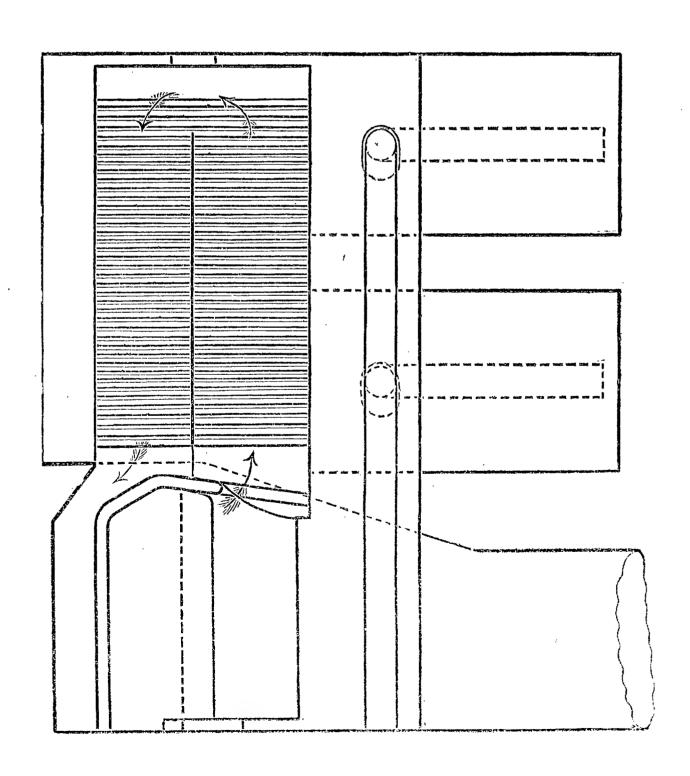
# UNION.

Merchant Steamer running between Panama and San Francisco. Engines and Boilers, designed and constructed Reaney, Neafie & Co., Philadelphia.

		Feet.	Inches.
Length on Deck,		180	0
Breadth of Beam,	,	25	4
Depth of Hold,		17	0
Tonnage, to	ns 513		
Average Draft of Water,		11	0
Two Direct Action Engines, Cylinders over Cra	anks.		
Diameter of Cylinders,	•	2	10
Length of Stroke,		2	10
Diameter of Propeller,	5	10	0
Length of		4	4.
Angle at Hub,	, 30		
Periphery,	49	0	
Pitch at Centre of Pressure,		31	4
Number of Blades,	, 4	-	
Area "	78	3 square	e feet.
Average Number of Revolutions,	40		
Average Pressure of Steam,	lbs. 30	)	
Cutting off at .	•	. 1	5
Two Iron Boilers; tubes 2 in. diameter outside.	•		
Whole Amount of Fire Surface,	4150	) squar	
Tube 66	3264	x	6 6
Grate .	66	$2\frac{1}{2}$	66
Ratio of Fire Surface to cubic foot of Cylinder,	118	3 to 1.	
Grate Surface,	60	$6\frac{4}{10}$ to	1.
Area of Space between Tubes,	1	7 squar	e feet.
Chimney,	1	$9_{\frac{6}{10}}$	66
Height of "above Grate,	. 4	0 feet.	
Consumption of Anthracite Coal per hour,*	120	0 lbs.	
Water Evaporated by 1 lb. of Coal,		$7\frac{35}{100}$ "	
Coal per hour to a square foot of Grate,	1	$9_{10}^{2}$	
r		•	

<sup>\*</sup> On trial trip to New York.



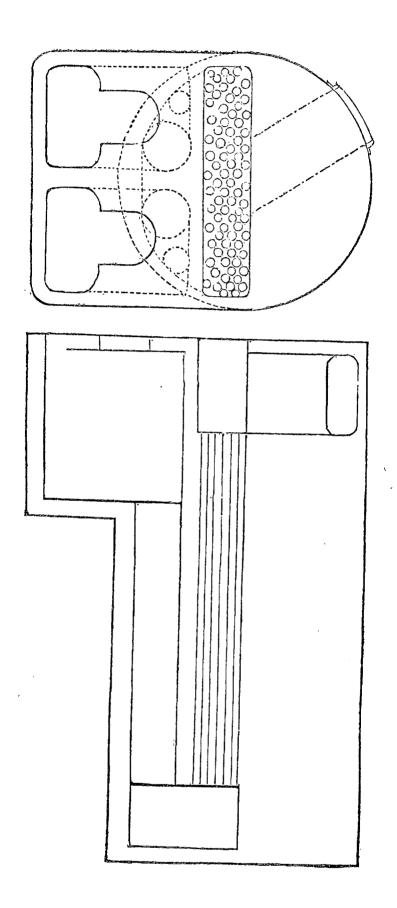


### MASSACHUSETTS.

War Steamer, belonging to the United States Navy. Engines and Boilers designed by John Ericsson, Esq., and constructed by Hogg & Delamater, New York.

						Feet.	Inches.
Length on Deck,		•		٠		161	0
Breadth of Beam,	ď		8			31	9
Depth of Hold, .		ø		•		20	0
Tonnage,	•		6	tons	779		
Average Draft of Water	r,	•		•		15	3
Two Inclined Engines.	•						
Diameter of Cylinders,				ď		2	1
Length of Stroke,	6		ď			3	0
Diameter of Propeller,		•		•		9	6
Length of	•		•			3	$1\frac{3}{4}$
Angle at Hub, .		•		•	*****		-4
" Periphery,	•		•		56°		
Pitch at Periphery,						20	0
Number of Blades,				•	6		-
Area	•		6		75 s	square	feet.
Average Number of Re	volutio	ons,			50	1	2 0 0,0
" Pressure of Ste		•		lbs.	40		
Cutting off at .	,	•		•		1	6
Two Iron Boilers (side	by side	e,)					
Whole Amount of Fire	•	- ,	9	1	580	square	e feet.
" Grate	. "	•		•	47	4	
Ratio of Fire Surface to	cubic	foot	of Cylind	ler.	77	$^{4}_{\sigma}$ to $^{1}$	1.
	Grate		•	,		$\frac{3}{0}$ to 1	
Area of 1st Flues,	•		,		-	•	are feet.
"Tubes,		•			$5^{1}_{1}$		44
"Chimney,				•	$6^{13}$	•	"
Height of "above	Grate,		<b>a</b>		1	0	
Consumption of Anthrac	•	al per	hour.	(	940	lbs.	
Water Evaporated by 1		-	,	•		3 66	
Coal per hour to a square					20	0	

<sup>\*</sup> Draft produced by an Exhausting Fan in chimney.

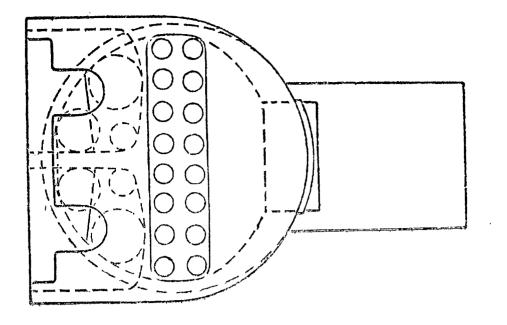


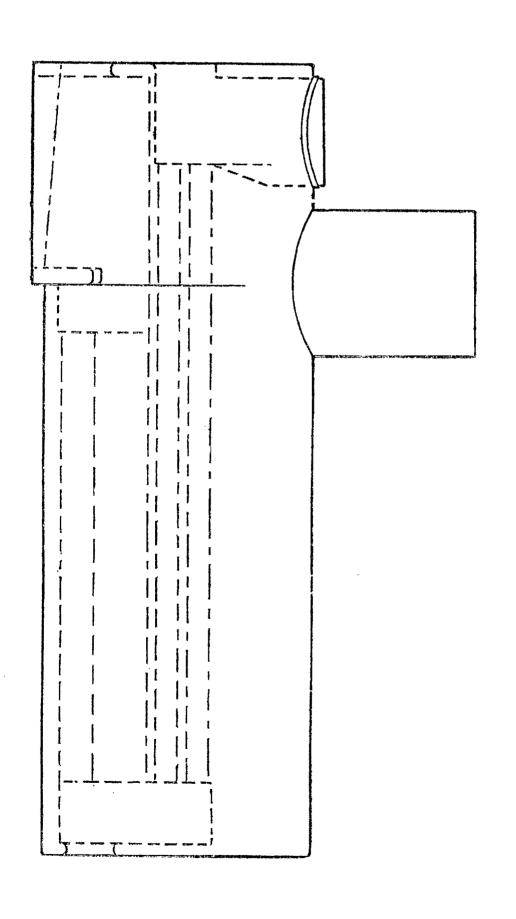
## RESCUE.\*

Steam Tug for New York Harbor. Engines and Boiler designed and constructed by Reaney, Neafie & Co., Philadelphia.

•		${f Fe}$	et.	Inches.
Length on Deck,	•	10	6	6
Breadth of Beam,		6	20	0
Depth of Hold, .	0		9	0
	tons	173		
Average Draft of Water (estimated),			9	9
Two Vertical Direct Action Engines; Cylinders	sove	r Cran	ıks.	
Diameter of Cylinders, .	*		2	2
Length of Stroke,			2	2
Diameter of Propeller,	٠		8	2
Length of			4	0
Angle at Hub, .	19	$30 \circ$		
" Periphery, .		48°		
Pitch at Centre of Pressure,	•	]	18	6
Number of Blades,		4		
Area of "	•	56 sq	uare	feet.
Average Number of Revolutions (estimated),		56		
Pressure of Steam,	lbs.	35		
Cutting off at		$11\frac{1}{2}$ i	$nch\epsilon$	es.
One Iron Boiler.				
Whole Amount of Fire Surface,		1013	squ	are feet.
"Grate".	•	36		"
Ratio of Fire Surface to cubic foot of Cylinder,	•	63	$3\frac{3}{10}$ t	o 1.
" Grate Surface,		28	3 to 3	1.
Area of 1st Flues,		6	$\frac{1}{2}$ sq	uare feet.
" 2d ".	*	۵	$4\frac{1}{4}$	66
" Chimney,		•	7	"
Height of " above Grate,		32	2 fee	et.
Consumption of Anthracite Coal per hour,		Charge the layer of the later o	in the second se	
Water Evaporated by 1 lb. of Coal,		<del>George S</del>	<b>3</b>	
Coal per hour to a square foot of Grate,	•			
* ************************************				

<sup>\*</sup> Not yet Finished.





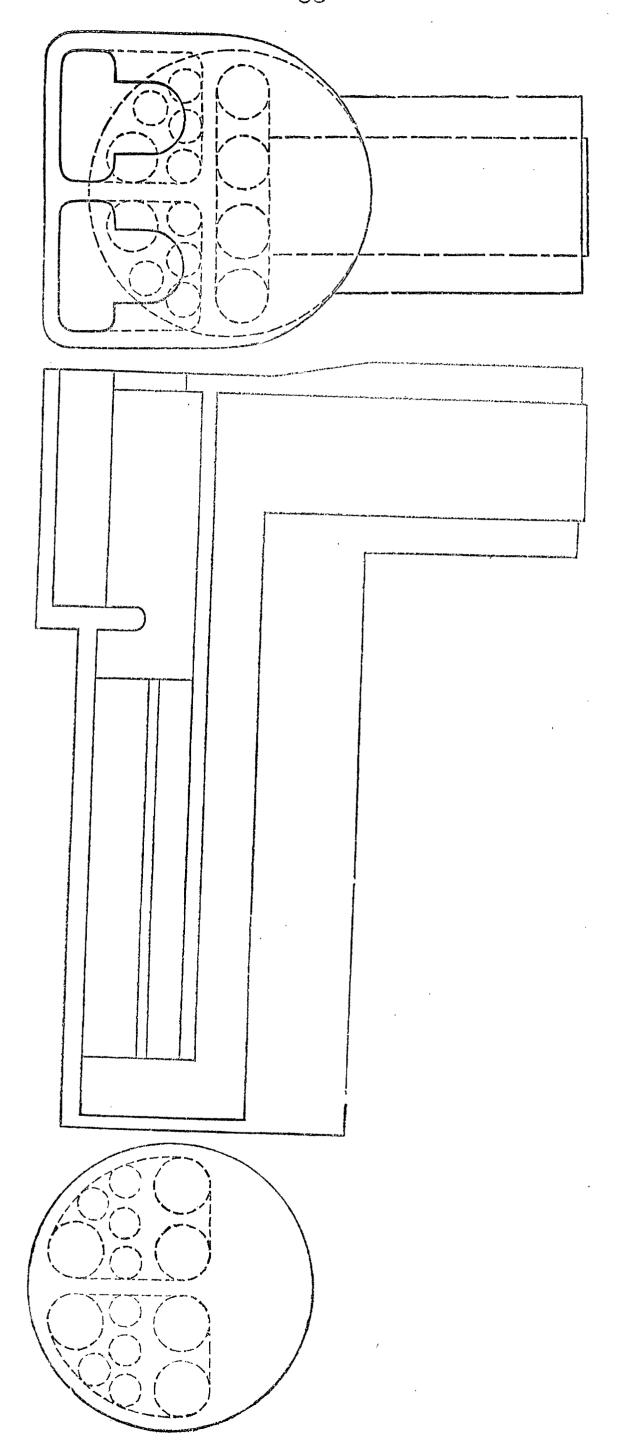
### NORTH AMERICA.

River Steamer running on the Hudson river from New York to Albany. Engine and Boilers designed and constructed by James Cunningham, Esq., Phænix Foundry, New York.

		Feet	Inc	hes.
Length on Deck, .		230		0
Breadth of Beam,	·	20		0
Depth of Hold, .	•	(		0
Tonnage,	tons			
Draft of Water, .	•		5 (	)
One Beam Engine,				
Diameter of Cylinder, .	•	4	<b>.</b> (	)
Length of Stroke,		1]		)
Diameter of Paddle Wheels, .	•	28	_	)
Length of Paddles,		10	) (	)
Depth of ".	•	2	2 4	1
Number of Paddles in each Wheel, 28, divided	in tw	o rows	of 14	each.
Average Dip of Wheel,		2		4
Average Number of Revolutions,	. 2	23		
Average Pressure of Steam, .	lbs. 3	35		
Cutting off at .	•	5	$\epsilon$	6
Two Iron Boilers (one on each guard).*				
Whole Amount of Fire Surface,	18	76 squ	are fe	et.
"Grate".		84	"	
Ratio of Fire Surface to cubic foot of Cylinder,		$13\frac{6}{10}$ t	o 1.	
" Grate Surface		$22\frac{3}{10}$ t		
Area of 1st Flues,		17 squ		et.
" 2d " .	• .	14	"	
" Chimnies,		17	"	
Height of "above Grate,	. {	50 feet		
Consumption of Anthracite Coal per hour,†	400	00 lbs	•	
Water Evaporated by 1 lb. of Coal, .		$5_{\frac{4}{10}}$	lbs	
Coal per hour to a square foot of Grate,	•	$47\frac{6}{10}$		

<sup>\*</sup> These boilers were the first of this form built, and may be considered the first that used anthracite coal with success.

<sup>†</sup> Fan blast under grate.



### SOUTH AMERICA.

River Steamer running from New York to Albany. Engine and Boilers designed and constructed by James Cunningham, Esq., Phænix Foundry, New York.

			Feet.	Inches.
Length on Deck, .	•		260	0
Breadth of Beam, .		•	26	9
Depth of Hold, .	•		9	3
Tonnage,		tons 633		
Average Draft of Water,	v		5	0
One Beam Engine.				
Diameter of Cylinder, .	•		4	6
Length of Stroke, .		•	11	
Diameter of Paddle Wheels,	•		30	0
Length of Paddles, .		•	11	
	14 inch	es each, or	2	4
Number of double Paddles in each	Wheel,	. 26		
Average Dip of Wheel,	•		2	4.
Average Number of Revolutions,		24		
Average Pressure of Steam,	•	" lbs. 45		
Cutting off at		•	5	6
Two Iron Boilers (one on each guar	d),			
Whole Amount of Fire Surface,	,	2490	square	e feet.
"Grate"		100	(	: 6
Ratio of Fire Surface to cubic foot	of Cylin	der, 14 <sub>7</sub>	$\frac{1.5}{0.0}$ to	1.
"Grate Surfac	ce,	$24_{7}$	$\frac{9}{0}$ to 1	
Area of 1st Flues, .		, 17	square	e feet.
" 2d " .	•	14		"
" Chimneys, .		, 17		66
Height of "above Grate,	•	50	feet.	
Consumption of Anthracite Coal per	r hour,*	6000	lbs.	
Water Evaporated by 1 lb. of Coal,	-	5	54 lbs	S.
Coal per hour to a square foot of Gr		60	"	

<sup>\*</sup> Fan blast under grate.

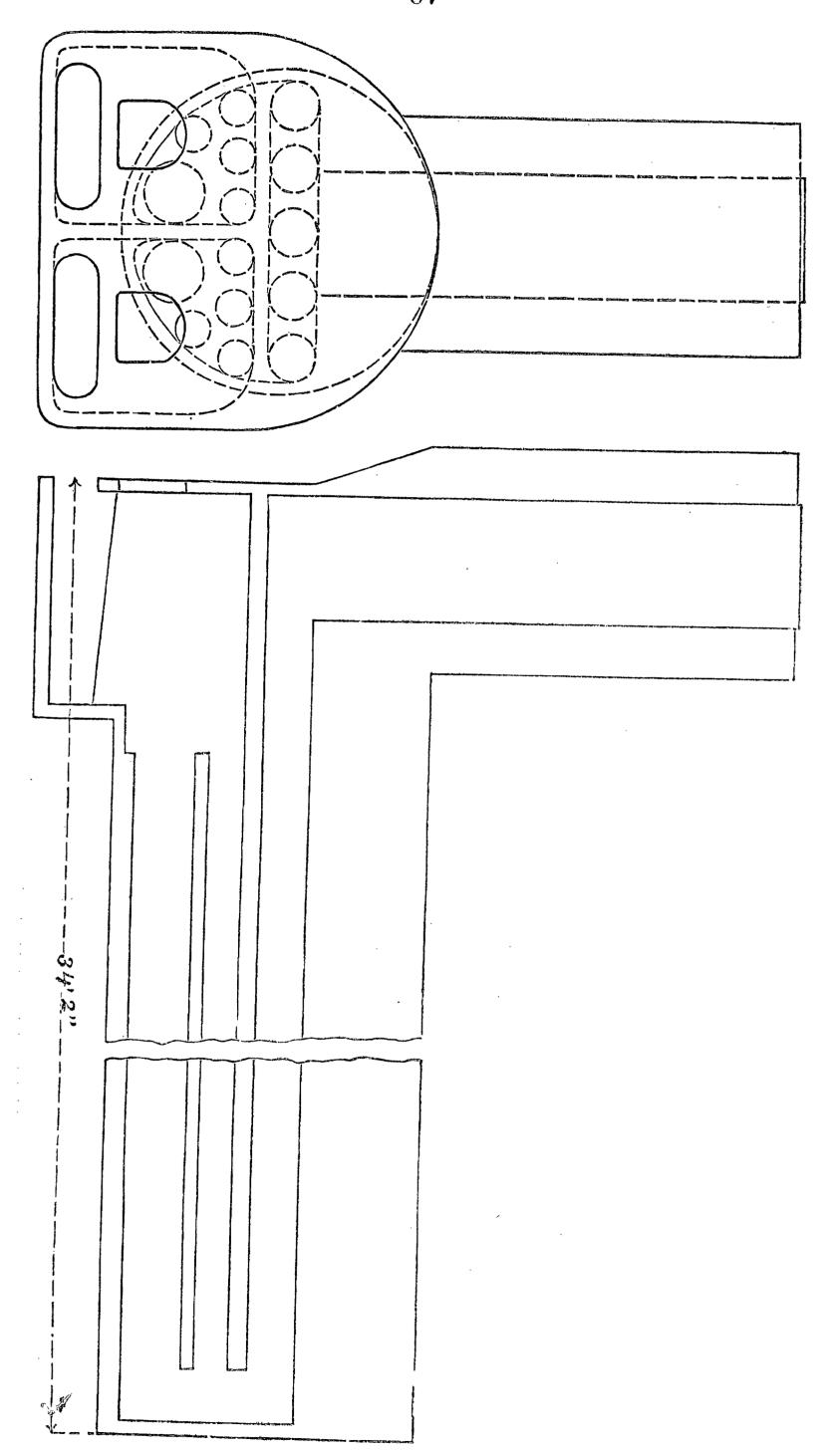
Boilers with same diameter of shell and flues, but six feet longer and one foot more front, giving increased grate surface.

## OREGON.

River Steamer running from New York to Albany. Engine and Boilers designed and constructed by Stillman Allen & Co., New York.

	Feet.	Inches.
Length on Deck,	318	0
Breadth of Beam,	35	0
Depth of Hold,	10	0
Tonnage, . tons 1094	4	
Average Draft of Water,	6	
One Beam Engine.		
Diameter of Cylinder,	6	
Length of Stroke,	11	0
Diameter of Paddle Wheels,	34	0
Length of Paddles,	11	0
Depth of "	1	6
Number of Paddles in each Wheel, . 29	8	
Average Dip of Wheel,	4	0
Average Number of Revolutions, . 1	9	
Average Pressure of Steam, . 30	0 lbs.	
Cutting off at	5	6
Two Iron Boilers, (one on each guard).		
Whole Amount of Fire Surface, . 375	6 square	feet.
"Grate Surface, 12	0	4
Ratio of Fire Surface to cubic foot of Cylinder, 19	2 to 1.	
"Grate Surface, . 3	$1^{3}_{10}$ to 1	•
	$21rac{1}{4}$ squa	re feet
" 2d, "	4	"
" Chimnies, . 1	$9\frac{1}{4}$	
Height of "above Grate, 6	0 feet.	
Consumption of Anthracite Coal per hour,* 665	0 lbs.	
Water Evaporated by 1 lb. of Coal, .	$5\frac{1}{2}$ "	
Coal per hour to a square foot of Grate,	55 "	

<sup>\*</sup> Fan blast under grate.

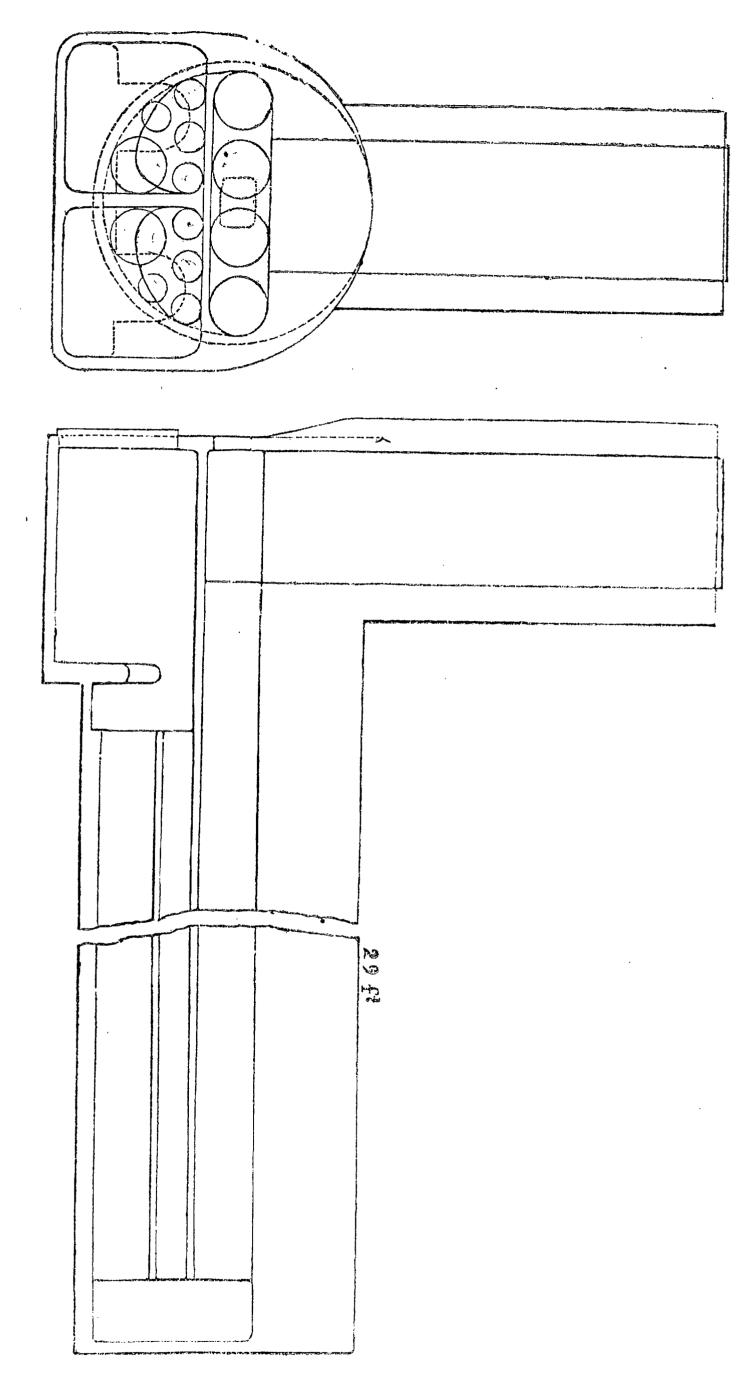


### ALIDA.

River Steamer running from New York and Albany, Engine and Boilers designed and constructed by H. R. Dunham & Co., New York.

	Feet.	Inches.
Length on Deck,	276	0
Breadth of Beam,	28	6
Depth of Hold,	9	6
Tonnage, . tons 7	41	
Average Draft of Water,	5	6
One Beam Engine		
Diameter of Cylinder,	4	8
Length of Stroke,	12	0
Diameter of Paddle Wheels,	32	8
Length of Paddles, .	9	6
Depth of "· · ·	2	9
Number of Paddles in each Wheel,	30	
Average Dip of Wheel,	2	11
Average Number of Revolutions,	23	
Average Pressure of Steam, . lbs.	40	
Cutting off at .	6	0
Two Iron Boilers (one on each guard).		
Whole Amount of Fire Surface, 27	786 squar	e feet.
"Grate".	100	"
Ratio of Fire Surface to cubic foot of Cylinder,	$13rac{6}{10}$ to	1.
" Grate Surface,	$27\frac{9}{10}$ to	1.
Area of 1st Flues,	17 squar	e feet.
" 2d "	$14\frac{1}{2}$	66
" Chimnies,	21	"
Height of " above Grate, .	50 feet.	
Consumption of Anthracite Coal per hour,* 60	000 lbs.	
Water Evaporated by 1 lb. of Coal,	6 lbs.	
Coal per hour to a square foot of Grate,	60 "	

<sup>\*</sup> Fan blast under grate.

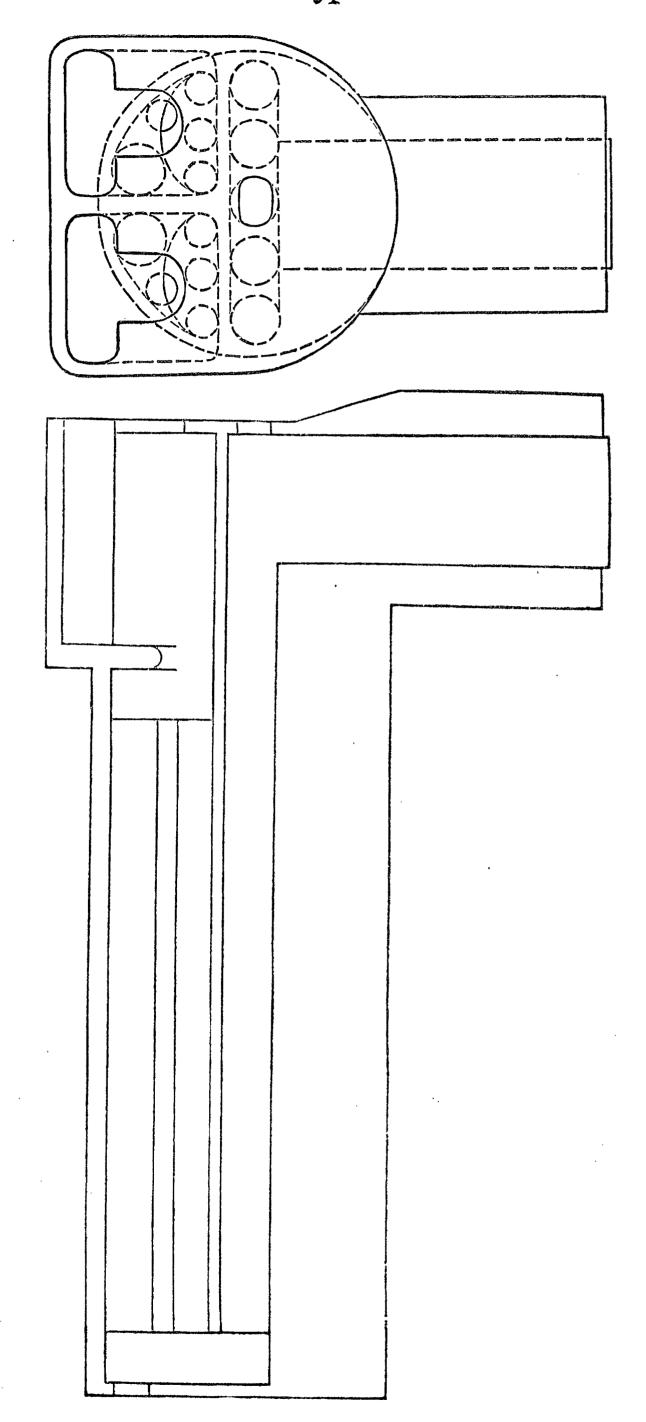


### NIAGARA.

River Steamer running on the Hudson River. Engine and Boilers designed and constructed by Hogg & Delamater, New York.

	Feet.	Inches.
Length on Deck,	265	0
Breadth of Beam,	28	6
Depth of Hold,	9	3
Tonnage, . tons	688	
Draft of Water,	5	0
One Beam Engine.		
Diameter of Cylinder,	5	0
Length of Stroke,	11	0
Diameter of Paddle Wheels,	30	0
Length of Paddles,	11	0
Depth of Paddles, 15 in each or	2	6
Number of Double Paddles in each Wheel,	24	
Dip of Wheel,	2	6
Average Number of Revolutions,	22	
Average Pressure of Steam, . lbs	s. 40	
Cutting off at	5	6
Two Iron Boilers; one on each guard.		
Whole Amount of Fire Surface, 2	696 square	feet.
" Grate Surface,	100 '	(
Ratio of Fire Surface to cubic foot of Cylinder,	$12\frac{1}{2}$ to 1.	
" Grate Surface,	27 to 1.	
Area of 1st Flues,	18 square	e feet.
" 2d "	14	6
Chimnies,	21 '	(
Height of "above Grate, .	50 feet.	
<b>O</b>	5500 lbs.	
Water Evaporated by 1 lb. of Coal, .	$6\frac{4}{10}$ lbs.	,
Coal per hour to a square foot of Grate,	55 "	

<sup>\*</sup> Fan Blast under Grate.

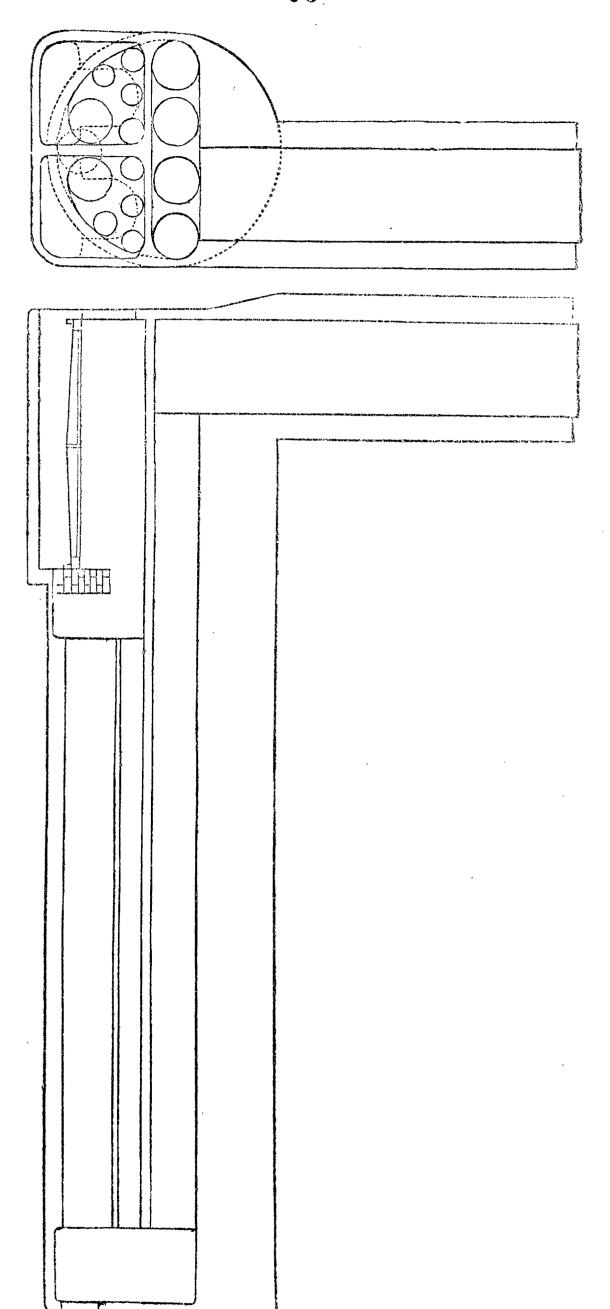


### JOSEPH BELKNAP.

River Steamer running on the Hudson River. Engine and Boilers designed and constructed by H. R. Dunham & Co., New York.

		Feet. Inches.
Length on Deck, .	•	187 0
Breadth of Beam,		27 4
Depth of Hold,	•	8 0
Tonnage,	tons	391
Draft of Water,	ø	$5 \qquad 0$
One Beam Engine.		
Diameter of Cylinder, .	ø	3 4
Length of Stroke,		$12 \qquad 0$
Diameter of Paddle Wheels,	٥	28 10
Length of Paddles,		8 0
Depth of ".	a	2 2
Number of "in each wheel,		28
Dip of Wheel,	•	2 6
Average Number of Revolutions .		24
" Pressure of Steam, "	lbs.	45
Cutting off at		6 6
Two Iron Boilers (below deck).		
Whole Amount of Fire Surface, .		2206 square feet.
"Grate".	•	80 "
Ratio of Fire Surface to cubic foot of Cylinder,		21 to 1.
"Grate Surface,		$27\frac{1}{9}$ to 1.
Area of 1st Flues, .		12 square feet.
" 2d " .	•	10 "
"Chimney,		10 "
Height of " above Grate,		60 feet.
Consumption of Anthracite Coal per hour,*		2800 lbs.
Water Evaporated by 1 lb. of Coal,		$7\frac{8}{10}$ lbs.
Coal per hour to a square foot of Grate,	•	35 "

<sup>\*</sup> Fan Blast under Grate.

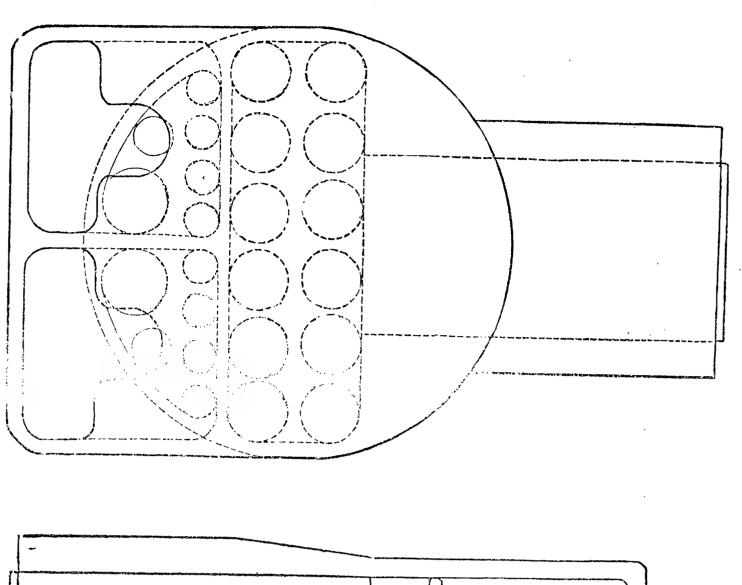


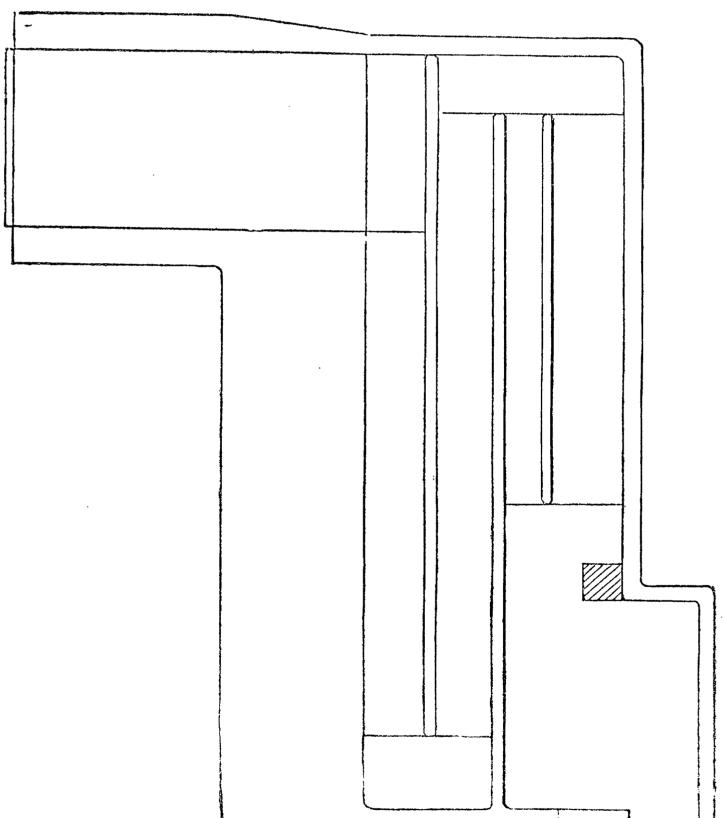
### MOUNTAINEER.

River Steamer, running on the Hudson River. Engine and Boiler designed and constructed by Joseph E. Coffee, Esq., New York.

					Feet.	Inches.
Length on Deck,		•		•	230	O
Breadth of Beam,			0		24	0
Depth of Hold, .	,	•		•	9	0
Tonnage,	•		. to	ns 491		
Draft of Water,				•	4	6
One Beam Engine.						
Diameter of Cylinder,	•	•		•	4	6
Length of Stroke,	•		•		11	0
Diameter of Paddle Wh	eels,	•		•	29	6
Length of Paddles,	•		•		9	6
Depth of		•		•	2	0
Number of Paddles in	each W	Vheel,		24	l.	
Dip of Wheel, .		•		•	2	0
Average Number of Re	volutio	ns,		24	l .	
" Pressure of Ste	eam,			lbs. 36	<b>;</b>	
Cutting off at .		•		•	6	0
One Iron Boiler (delow	deck).					
Whole Amount of Fire	Surface	e,	•	2114	4 squar	e feet.
" Grate	e "	•		. 60	6	"
Ratio of Fire Surface to	cubic	foot of C	Cylinder	, 13	2 to 1.	
" "	Grate	Surface,	)	32	2 to 1.	
Area of 1st Flues,	•		•	13	3 squ <mark>a</mark> r	e feet.
" 2d and 3d Flue	s, each	١,		13	}	"
" Chimney,				. 19	$\frac{6}{10}$	66
Height of " above	Grate,		0	60	feet.	
Consumption of Anthra	cite Co	al per ho	ur,*	5000	lbs.	
Water Evaporated by 1				. (	$3\frac{2}{10}$ "	
Coal per hour to a squa	re foot	of Grate	•	76	3 46	

<sup>\*</sup> Fan Blast under Grate.



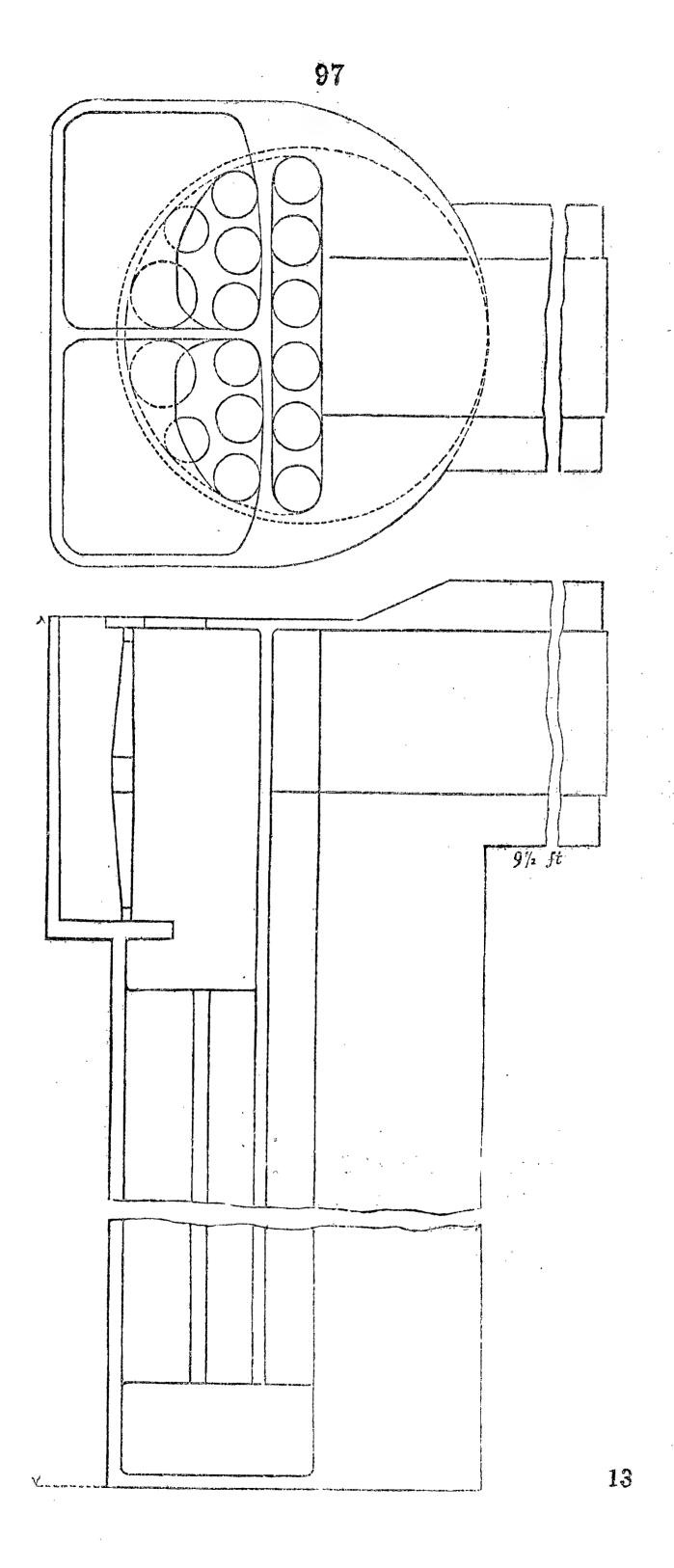


# NEW WORLD.

River Steamer running from New York to Albany. Engine and Boilers designed and constructed by T. F. Secor & Co., New York.

		Feet.	Inches.
Length on Deck,		371	0
Breadth of Beam,	0	35	0
Depth of Hold,		11	0
	s 1418		
Draft of Water,		5	6
One Beam Engine.			
Diameter of Cylinder,	•	6	4
Length of Stroke,		15	0
Diameter of Paddle Wheels, .	•	45	0
Length of Paddles,		12	0
Depth "		1	6
Number of Paddles in each Wheel,	38		
Dip of Wheel,	<del>s</del>	3	4
Average Number of Revolutions,	17		
· ·	lbs. 45		
Cutting off at .		8	0
Two Iron Boilers; one on each guard.			
Whole Amount of Fire Surface,	5338	square	e feet.
Grate .	. 212	(	; <b>(</b>
Ratio of Fire Surface to cubic foot of Cylinder,	11	$\frac{3}{10}$ to 3	i.
Grate Surface,	25	to 1.	
Area of 1st Flues, .	34	4 squa	re feet.
" 2d "	2	0	66
Chimnies, .	3	4	66
Height of "above Grate,	6	0 feet.	
Consumption of Anthracite Coal per hour,*	9000	lbs.	
Water Evaporated by 1 lb. of Coal,	7	66	
Coal per hour to a square foot of Grate,	42	5 44	

<sup>\*</sup> Fan Blast under Grate.

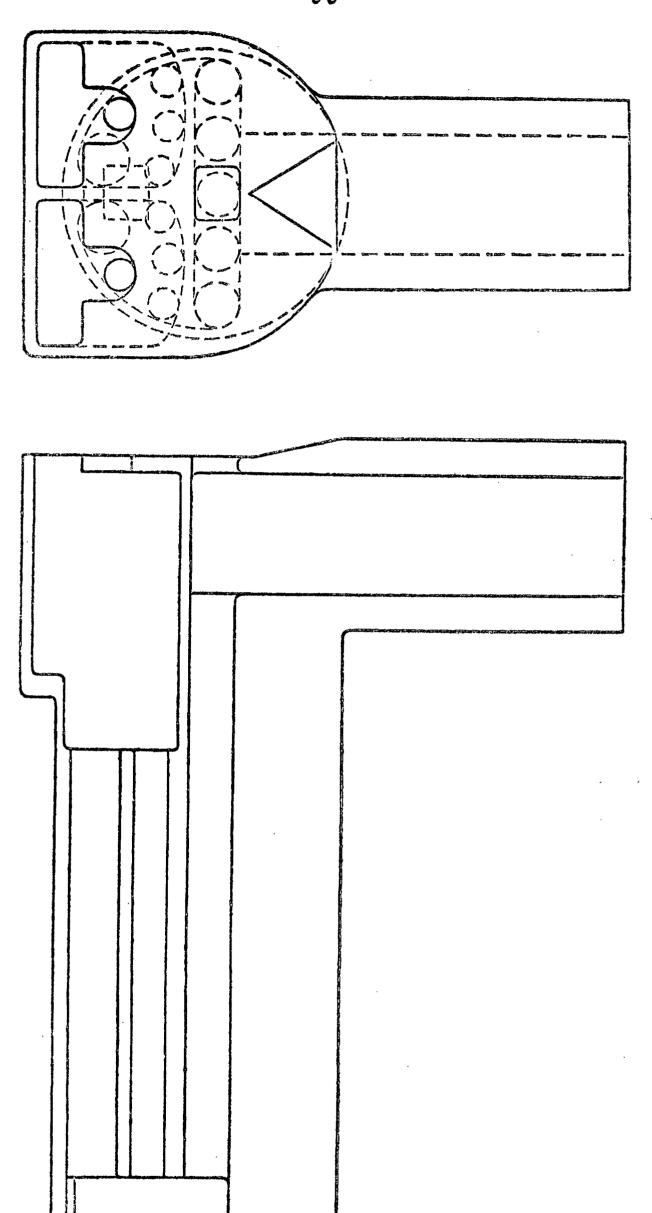


### TRAVELLER.

River Steamer running on Long Island Sound, from New York to New Haven. Engine and Boilers designed and constructed by the Allaire Works, New York.

		Feet.	Inches.
Length on Deck,	ď	225	0
Breadth of Beam,		29	0
Depth of Hold,	•	9	6
Tonnage,	tons	600	
Draft of Water,	•	5	0
One Beam Engine,			
Diameter of Cylinder, .	•	4	4
Length of Stroke,		11	0
Diameter of Paddle Wheels, .	•	29	3
Length of Paddles,		8	0
Depth of ".	•	2	4
Number of Paddles in each Wheel,		20	
Dip of Wheel,		3	0
Average Number of Revolutions,	•	24	
Average Pressure of Steam,	lbs.	30	
Cutting off at .	•	5	6
Two Iron Boilers (one on each guard).			
Whole Amount of Fire Surface,	20	030 squa	re feet.
"Grate".		95	66
Ratio of Fire Surface to cubic foot of Cylinde	er,	$12\frac{1}{2}$ to	1.
"Grate Surface		$21\frac{3}{10}$ to	l.
Area of 1st Flues,		$18\frac{1}{2} \text{ sq } \text{ is}$	are feet.
" 2d " .	•	$12_{10}^{6}$	"
Chimnies,		$17_{10}^{4}$	"
Height of "above Grate,	ø	40 feet.	
Consumption of Anthracite Coal per hour,*	40	000 lbs.	
Water Evaporated by 1 lb. of Coal, .		6	
Coal per hour to a square foot of Grate,	ø	42 "	

<sup>\*</sup> Fan Blast under Grate.



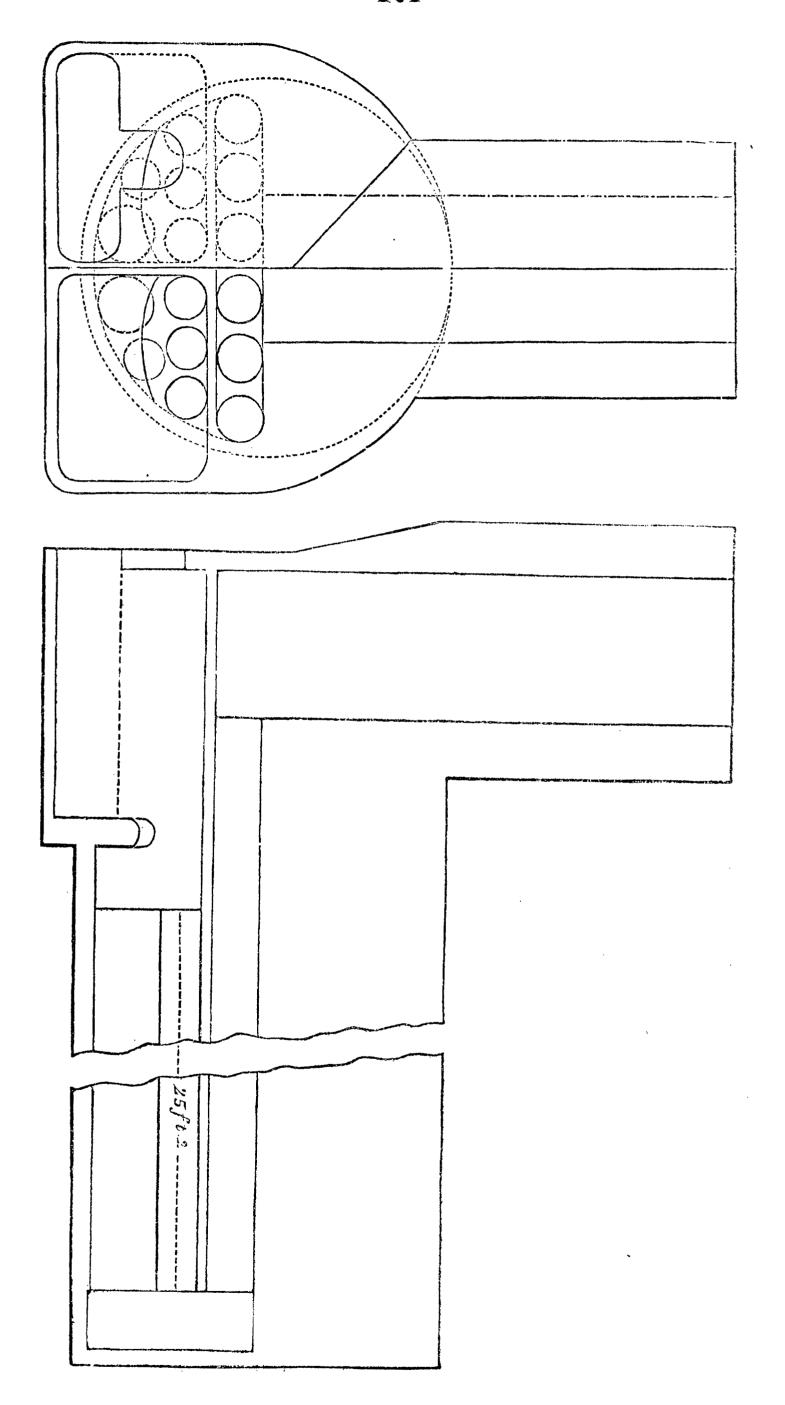
### 100

## ISAAC NEWTON.

River Steamer running on the Hudson. Engine and Boilers designed and constructed at the Allaire Works, New York.

				Feet.	Inches.
Length on Deck,	•		ø	338	0
Breadth of Beam,		•		40	0
Depth of Hold, .	*		٥	11	0
Tonnage,	•	a	tons 1454		
Draft of Water,			•	5	0
One Beam Engine					
Diameter of Cylinder,	•		٠	6	9
Length of Stroke, .	,	•		12	0
Diameter of Paddle Whee	ls, .		•	39	0
Length of Paddles,	•	•		12	0
Depth of " 1	8 inches	each, or		3	0
Number of Double Paddle	es in eac	h Wheel,	32		
Dip of Wheel,	9		<b>Q</b> .	4	0
Average Number of Revo	lutions,	•	17		
Average Pressure of Steam	n, .		lbs. 35		
Cutting off at	•			6	O
Two Iron Boilers (one on	each gua	ırd).			
Whole Amount of Fire Su	ırface,	•	4540	square	e feet.
"Grate			161		"
Ratio of Fire Surface to co	abic foot	of Cylind	ler, 10-	<u>6</u> to 1	. 0
" " G	rate Surf	ace,		2 to 1	
Area of 1st Flues,	•		,		are feet.
" 2d " .		•	17		"
" Coimnies,	o	Ð	26	U	"
Height of 66 above Gr	ate,	<b>.</b>	65	feet.	
Consumption of Anthracit	e Coal pe	er hour,*			
Water Evaporated by 1 lb	-	<u>-</u>		lbs.	
Coal per hour to a square		•	50	•	
- •					

<sup>\*</sup> Fan blast under grate.

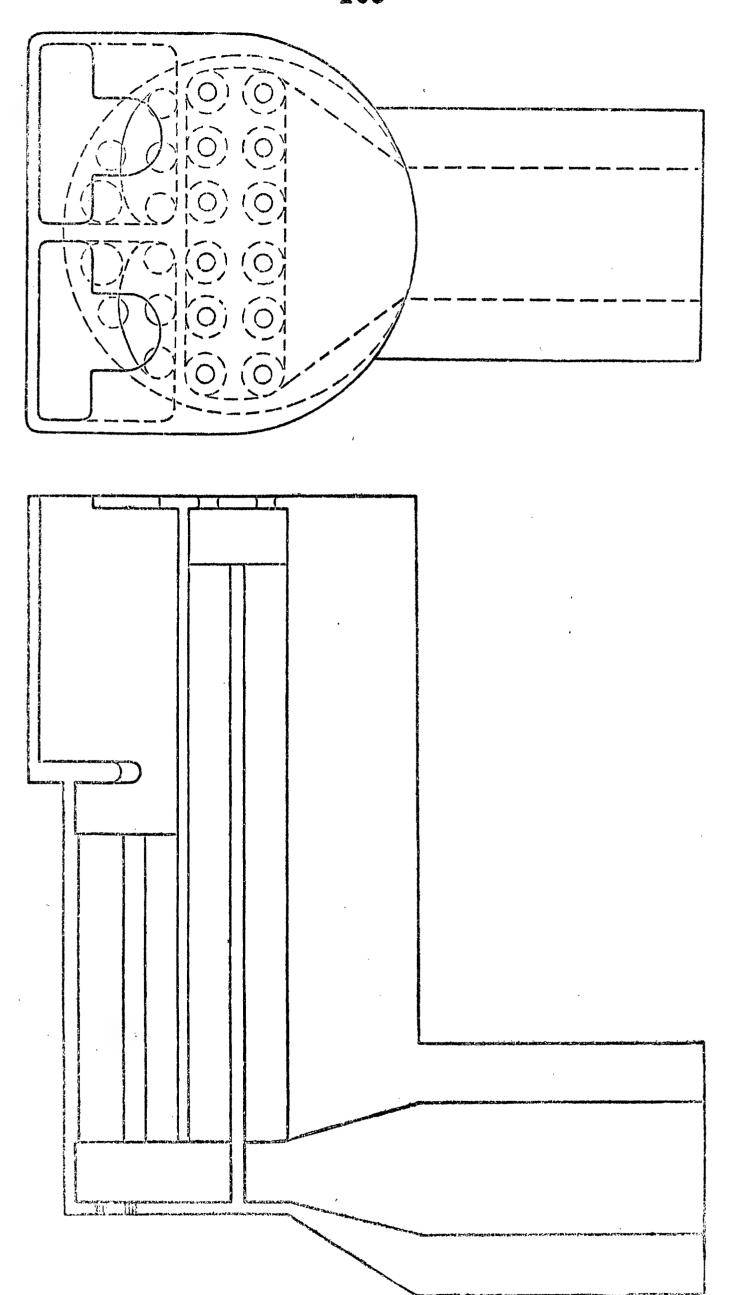


# 102 ROGER WILLIAMS.

River Steamer running on the Hudson. Engine and Boiler designed and constructed by H. R. Dunham & Co., New York.

	Feet.	Inches.
Length on Deck,	212	0
Breadth of Beam,	27	0
Depth of Hold,	9	0
Tonnage, . tons	501	
Draft of Water,	5	6
One Beam Engine.		
Dia neter of Cylinder,	3	8
Length of Stroke,	11	0
Diameter of Paddle Wheels, .	28	7
Length of Paddles,	8	2
Depth of "···································	2	6
Number of Paddles in each Wheel, .	22	•
Dip of Wheel,	3	0
Average Number of Revolutions,	22	
Average Pressure of Steam, "Ib	s. 28	
Cutting off at	6	6
One Iron Boiler (below deck).		
Whole Amount of Fire Surface,	1384 square	e feet.
"Grate"	<b>7</b> 2	6
Ratio of Fire Surface to cubic foot of Cylinder,	12 to 1.	
" Grate Surface,	$19\frac{2}{10}$ to 1	•
Area of 1st Flues,	$8_{10}^{2}$ squa	are feet.
" 2d " .	$6\frac{1}{2}$	"
" Chimney,	$10\frac{1}{2}$	<b>(</b>
Height of "above Grate, .	60 feet.	
Consumption of Anthracite Coal per hour,*	3000 lbs.	
Water Evaporated by 1 lb. of Coal,	$5_{i \ 0}^{9}$ lbs.	
Coal per hour to a square foot of Grate,	41 "	

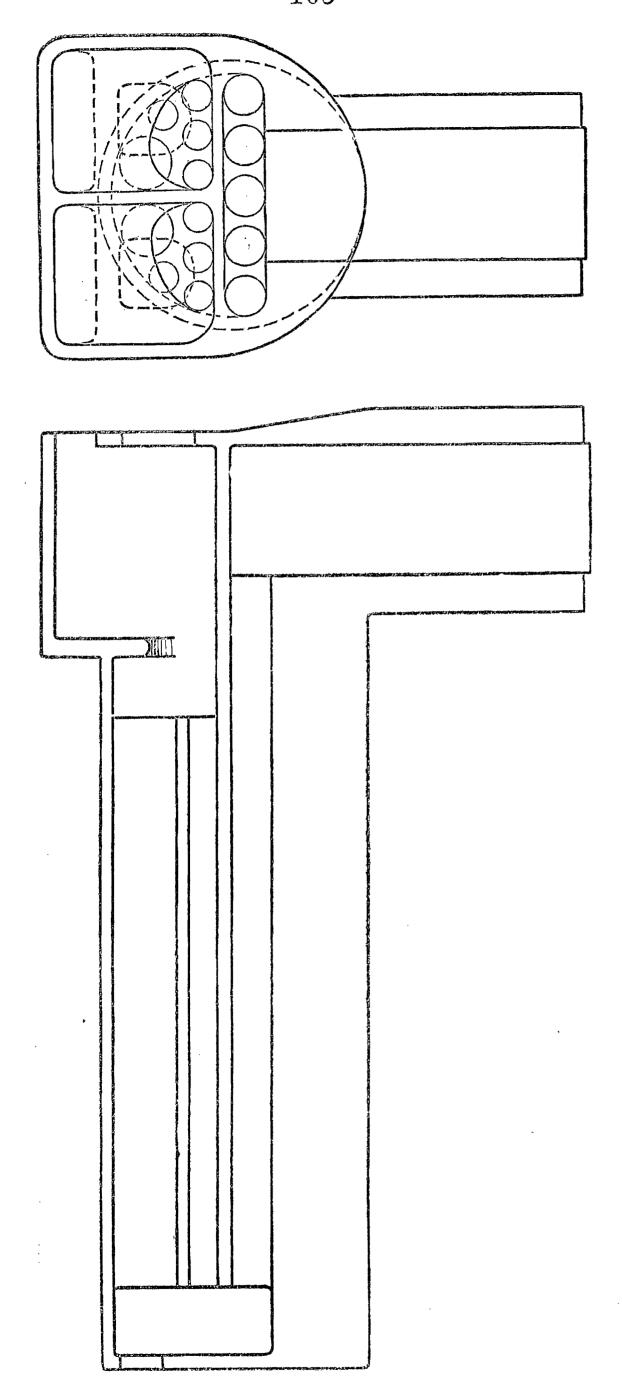
<sup>\*</sup> Fan blast under grate.



River Steamer running on the Hudson. Engine and Boilers designed and constructed by T. F. Secor & Co., New York.

	Feet.	Inches.
Length on Deck,	225	0
Breadth of Beam,	28	0
Depth of Hold,	9	6
Tonnage, . tons 583	2	
Draft of Water,	4	6
One Beam Engine.		
Diameter of Cylinder,	4	
Length of Stroke,	11	0
Diameter of Paddle Wheels,	19	6
Length of Paddles,	9	0
Depth of "·	2	0
Number of Paddles in each Wheel, . 2	1	
Dip of Wheel,	2	0
Average Number of Revolutions, . 2	4	
Average Pressure of Steam, 5	0 lbs.	
Cutting off at	8	0
Two Iron Boilers, (one on each guard).		
Whole Amount of Fire Surface, . 224	l4 squar	e feet.
" Grate Surface, 8	88	
Ratio of Fire Surface to cubic foot of Cylinder, 1	$6\frac{1}{4}$ to 1.	
" " Grate Surface, . 2	$25\frac{1}{2}$ to 1.	•
Area of 1st Flues, .	15 squar	e feet
" 2d, "	10	"
" Chimnies, .	16	<b>6</b> \$.
Height of "above Grate,	50 feet.	
Consumption of Anthracite Coal per hour,* 600	00 lbs.	
Water Evaporated by 1 lb. of Coal, .	6 6 4	,
Coal per hour to a square foot of Grate,	68 "	

<sup>\*</sup> Fan blast under grate.

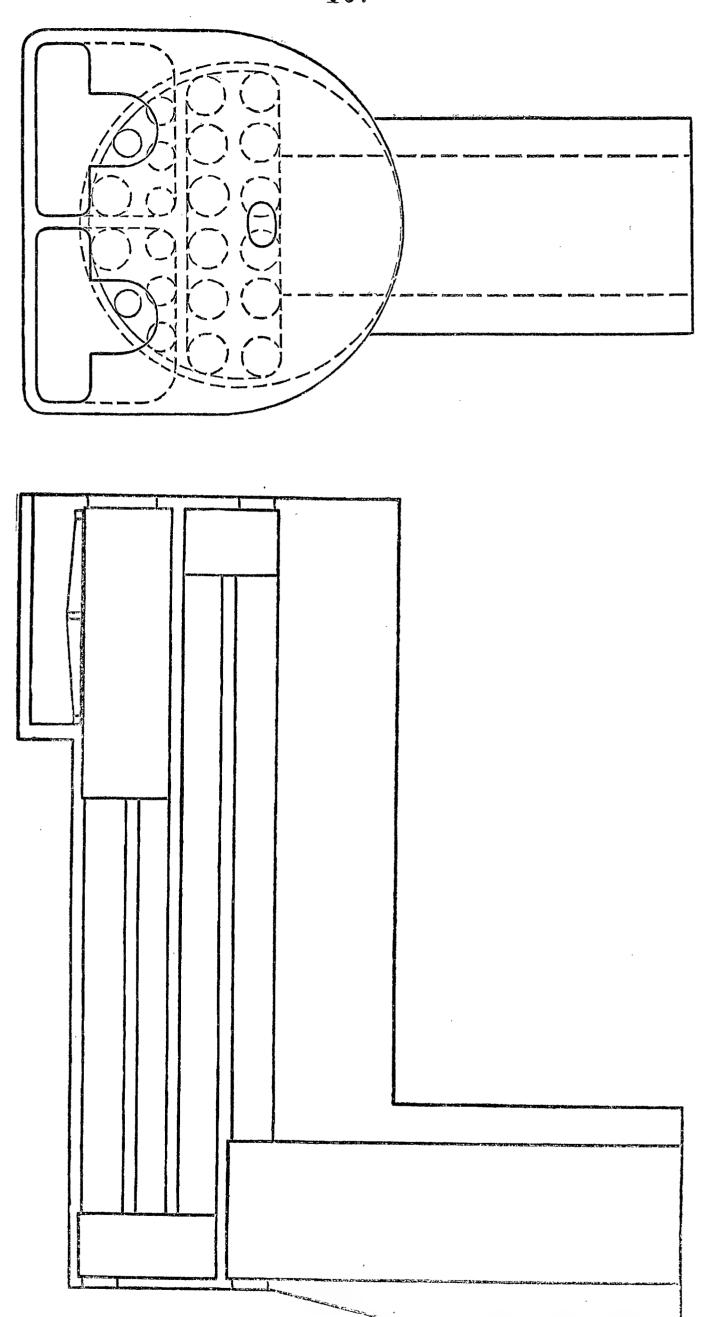


# ARMENIA.

River Steamer running on the Hudson River. Engine and Boiler designed and constructed by H. R. Dunham & Co., New York.

				Feet.	Inches
Length on Deck,	ø		ø	185	0
Breadth of Beam,	•	ø		28	O
Depth of Hold, .	ø		•	8	6
Tonnage,	o	o	tons 4	21	
Draft of Water,	٠		o	3	9
One Beam Engine.					
Diameter of Cylinder,	٠		o	2	10
Length of Stroke,	o	Φ		14	O
Diameter of Paddle Wh	eels, .		o	29	4
Length of Paddles,	•	٥		8	3
Depth of "	۰		٥	2	4
Number of Paddles in 6	each Who	eel,		26	
Dip of Wheel, .	•		o	2	4
Average Number of Re-	volutions	,		23	
" Pressure of Ste	am,		lbs.	35	
Cutting off at .	•		٥	10	O
One Iron Boiler (below	deck).				
Whole Amount of Fire	Surfa <b>ce</b> ,	ø	14	02 square	e feet.
" Grate	"		•	57 '	6
Ratio of Fire Surface to	cubic fo	ot of Cyl	inder,	16 to 1.	
66 66 66	Grate Su	ırface,	•	$24\frac{1}{2}$ to 1.	
Area of 1st Flues,	•	o		$7\frac{1}{4}$ squa	re feet.
" 2d and 3d Flues	s, each,			$5\frac{1}{2}$	66
" Chimney,			o	$11\frac{1}{2}$	66
Height of "above	Grate,	•		60 feet.	
Consumption of Anthrac	ite Coal 1	per hour,	,* 25	00 lbs.	
Water Evaporated by 1	lb. of Co	oal,	•	7 "	
Coal per hour to a squar	e foot of	Grate,		44 "	
-		-			

<sup>\*</sup> Fan blast under grate.

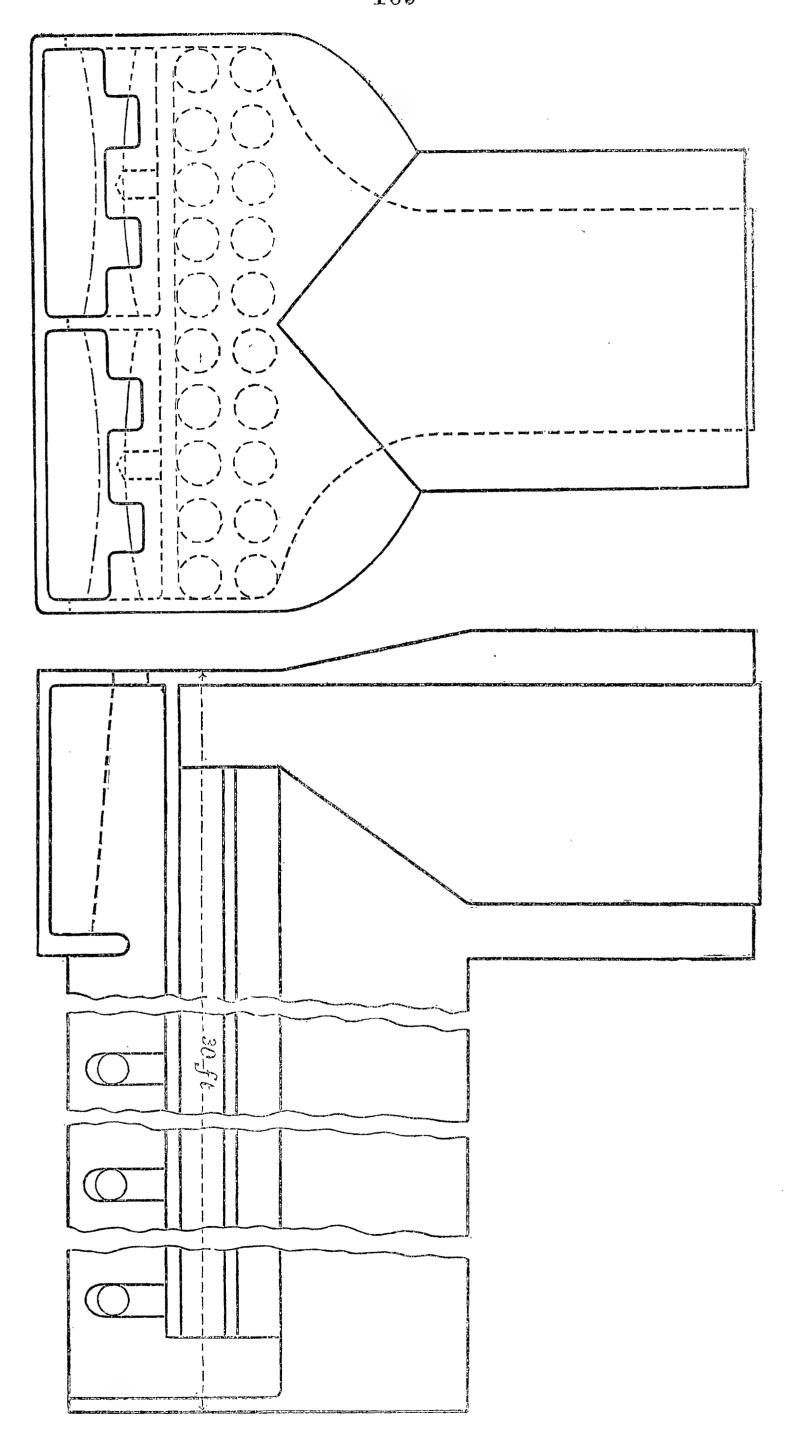


## AMERICA.

River Steamer running on the Delaware River. Engine and Boiler designed and constructed by I. P. Morris & Co., Philadelphia.

	Feet.	Inches.
Length on Deck,	216	0
Breadth of Beam,	30	0
Depth of Hold,	8	0
Tonnage, tons 508		
Draft of Water,	4	0
One Beam Engine.		
Diameter of Cylinder,	3	8
Length of Stroke,	12	0
Diameter of Paddle Wheels,	30	0
Length of Paddles,*	9	0
Depth "·	2	0
Number of Paddles in each Wheel,  40		
Dip of Wheel,	2	0
Average Number of Revolutions, 23		
Average Pressure of Steam, lbs. 25		
Cutting off at	9	0
One Iron Boiler (below deck).		
Whole Amount of Fire Surface, 2753	square	
" Grate "	(	•
<b>v</b>	$\frac{7}{10}$ to 1	. •
" Grate Surface, 26	to 1.	
Area of 1st Flues, . 14	square	
" 2d "	6	6
" Chimney,	6 6	
Height of "above Grate, 60	feet.	
Consumption of Anthracite Coal per hour, 3100	lbs.	
	$\frac{82}{100}$ lbs	
Coal per hour to a square foot of Grate, 29	$\frac{1}{2}$	"

<sup>\*</sup> There were two rows of 20 paddles in each wheel; each paddle being 4 feet 10 inches long, but lapping each other so as to present a surface of but 9 feet in length.

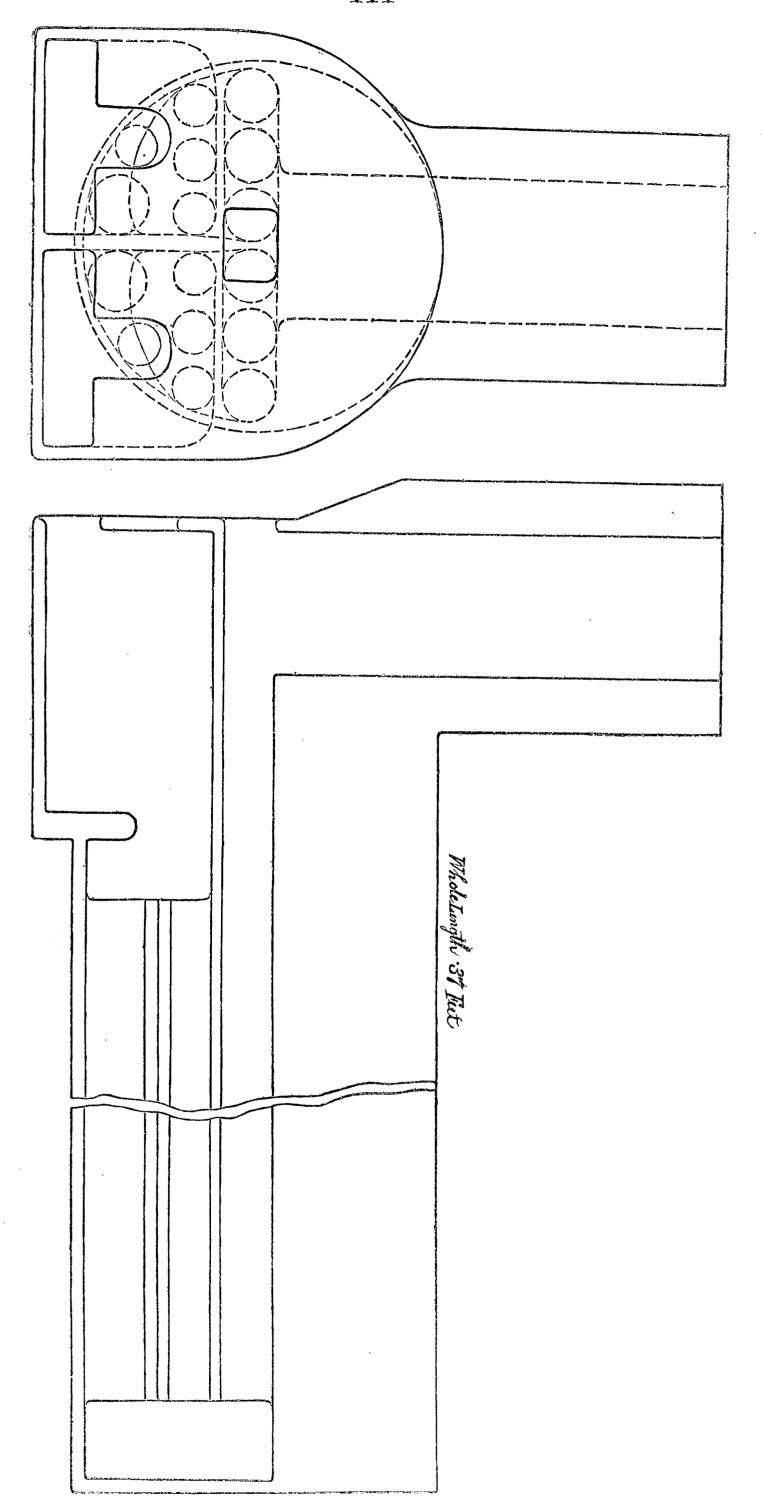


# BAY STATE.

River Steamer running on Long Island Sound from New York to Fall River. Engine and Boilers designed and constructed at the Allaire Works, New York.

		Feet.	Inches.
Length on Deck,		300	0
Breadth of Beam,	:	39	0
Depth of Hold,		13	2
Tonnage, . tons	s 1492		
Draft of Water,		8	0
One Beam Engine.			
Diameter of Cylinder,		6	4
Length of Stroke,		12	0
Diameter of Paddle Wheels, .	•	38	0
Length of Paddles,		10	3
Depth of Paddles, .	•	2	8
Number of Paddles in each Wheel,	30		
Dip of Wheel,		3	6
Average Number of Revolutions,	18		
Average Pressure of Steam, . 1	bs. 25		
Cutting off at		6	0
Two Iron Boilers (one on each guard).			
Whole Amount of Fire Surface, .	4554	square	feet.
"Grate Surface,	173	` ""	
Ratio of Fire Surface to cubic foot of Cylinder,	12	to 1.	
" Grate Surface,	$29_{\overline{1}}$	$\frac{3}{0}$ to 1.	
Area of 1st Flues,	$26\frac{3}{2}$	} squar	e feet.
" 2d "	$18_{i}$	$\frac{9}{0}$	"
"Chimnies, .	. 25		"
Height of "above Grate, .	<b>60</b> :	feet.	
Consumption of Anthracite Coal per hour,*	<b>6500</b> 1	lbs.	
Water Evaporated by 1 lb. of Coal,	$5_{ar{1}}$	$\frac{82}{00}$ lbs	•
Coal per hour to a square foot of Grate,	38	3 "	

<sup>\*</sup> Fan Blast under Grate.

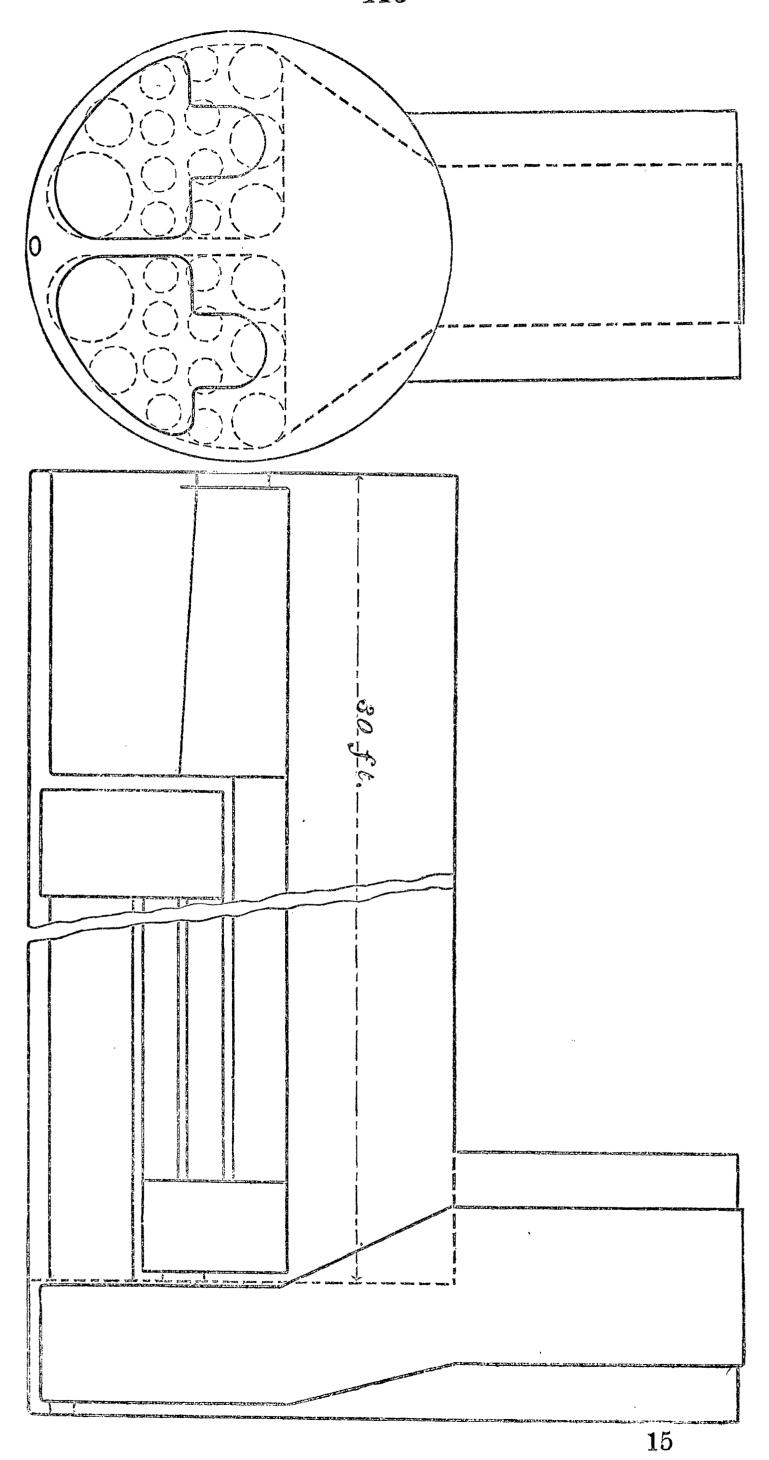


# 112 EMPIRE STATE.

River Steamer running on Long Island Sound from New York to Fall River. Engine and Boilers designed and constructed by the Allaire Works, New York.

	Fe	eet. Inches	•
Length on Deck,	. 30	04 0	
Breadth of Beam,	•	39 <b>0</b>	
Depth of Hold, .	0 .	13 6	
	ns 1551		
Draft of Water, .	0	8 0	
One Beam Engine.			
Diameter of Calindon	•	6 4	
Length of Stroke,		12 0	
Diameter of Paddle Wheels,	6	38 0	
Length of Paddles,		10 3	
Depth of "	9	<b>2</b> 8	
Number of "in each wheel,	30		
Dip of Wheel,	•	3 6	
Average Number of Revolutions .	18		
"Pressure of Steam, "	bs. 25		
Cutting off at		6 0	
Two Iron Boilers (one on each guard).			
Whole Amount of Fire Surface, .	4160 sc	quare feet.	
"Grate "	166	66	
Ratio of Fire Surface to cubic foot of Cylinder,	11 to	o 1.	
"Grate Surface,	25 t	o 1.	
Area of 1st Flues,	$18\frac{8}{1}$	$\frac{1}{0}$ square fee	et.
" 2d "	. 25	66	
" 3d "	$22rac{6}{1}$	<u>66</u>	
" Chimnies, .	32	"	
Height of "above Grate,	60 f	fee <b>t.</b>	
Consumption of Anthracite Coal per hour,*	6500 I	bs.	
Water Evaporated by 1 lb. of Coal,	5 -	$\frac{82}{100}$ lbs.	
	$39_{1}$		
T ,	•	<b>~</b>	

<sup>\*</sup> Fan Blast under Grate.

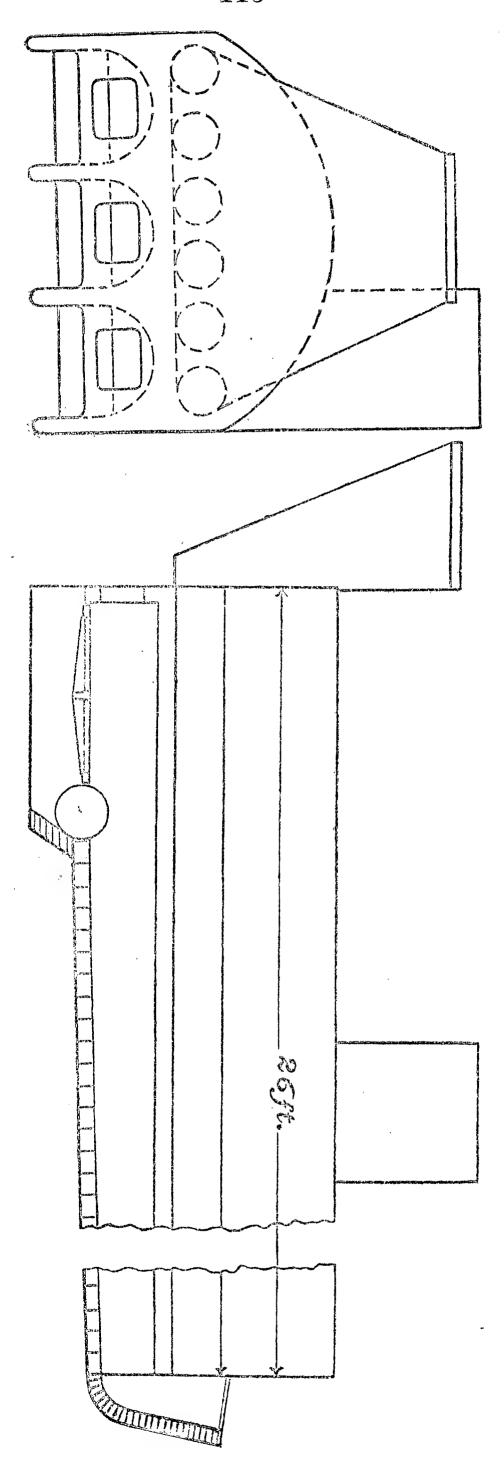


# 114 ANGLO SAXON.

Steam Tug used on the Mississippi below New Orleans. Engines and Boilers designed and constructed by H. R. Dunham & Co., New York.

					Feet.	Inches.
Length on Deck,		ø		•	170	0
Breadth of Beam,	•		•		28	0
Depth of Hold, .		•		•	11	0
Tonnage,	•		٠	tons 500		
Draft of Water,		•		•	7	6
Two Engines, slightly inc	clined,	)				
Diameter of Cylinder,		•		•	4	2
Length of Stroke,			•		8	O
Diameter of Paddle Whee	els,	•		ø	24	O
Length of Paddles,	٠		•		9	0
Depth of		9		•	2	6
Number of Paddles in ea	ch Wł	neel,		22		
Dip of Wheel, .		ø		o	2	6
Average Number of Revo	olution	ıs,*	0	22		
Average Pressure of Steam	m,*	•		lbs. 25		
Cutting off at	•		0		4	O
Two Iron Boilers on Dec	k.					
Whole Amount of Fire St	urface,	•	æ	2200	square	feet.
"Grate	"	•		95		"
Ratio of Fire Surface to c	ubic f	oot of (	Cylinde	r, 10	$\frac{1}{10}$ to 1	. •
	Grate S	Surface,	)	23	to 1.	
Area of 1st Flues, at Brid	lge,		a	18	square	feet.
" 2d " .	,	•		17		66
" Chimnies,	•		0	27		66
Height of " above G	rate,	•		50	feet.	
Consumption of Anthracit	e Coa	l per h	our,	fütarenten <b>ism</b>		
Water Evaporated by 1 I	b. of C	Coal,		<del>un vint</del> ia		
Coal per hour to a square	foot o	f Grate	<b>,</b>	<b>e</b> szvítőssá	•	

<sup>\*</sup> Results from trial trip, fuel not ascertained.



## 116

# MAY FLOWER.

Merchant Steamer on Lake Erie, running from Buffalo to Detroit. Engine and Boilers designed by Hogg & Delamater, and constructed by the West Point Foundry.

		Feet.	Inches.
Length on Deck,	0	288	0
Breadth of Beam,		35	6
Depth of Hold,	•	12	6
Tonnage, ton	s 1242		
Draft of Water, .	•	8	0
One Beam Engine.			
Diameter of Cylinder, .	•	6	
Length of Stroke,		11	0
Diameter of Paddle Wheels, .	•	35	0
Length of Paddles,		11	0
Depth of " 18 inches each, o	or	3	0
Number of Double Paddles in each Wheel,	28		
Dip of Wheel,	•	4.	0
Average Number of Revolutions, .	17		
Average Pressure of Steam, .	36	lbs.	
Cutting off at		8	0
Three Iron Boilers (below deck, with two chin	nnies).		
Whole Amount of Fire Surface,	479	l squar	e feet.
"Grate Surface,	151		66
Ratio of Fire Surface to cubic foot of Cylinder,	1.5	$5\frac{4}{10}$ to	1.
"Grate Surface," .	3	$\frac{7}{10}$ to	1.
Area of 1st Flues, .			are feet
" 2d, " .	27	7	"
"Chimnies, .	39	$\frac{1}{4}$	66
Height of "above Grate, .	60	) feet.	
Consumption of Bituminous Coal per hour,	6160	lbs.	
Water Evaporated by 1 lb. of Coal,	(	$3\frac{3}{10}$ "	
Coal per hour to a square foot of Grate,		) 8 "	

Three Boilers of the same form and diameter as those used on board the Steamer Falcon, their length being increased to 30 feet.

#### 118

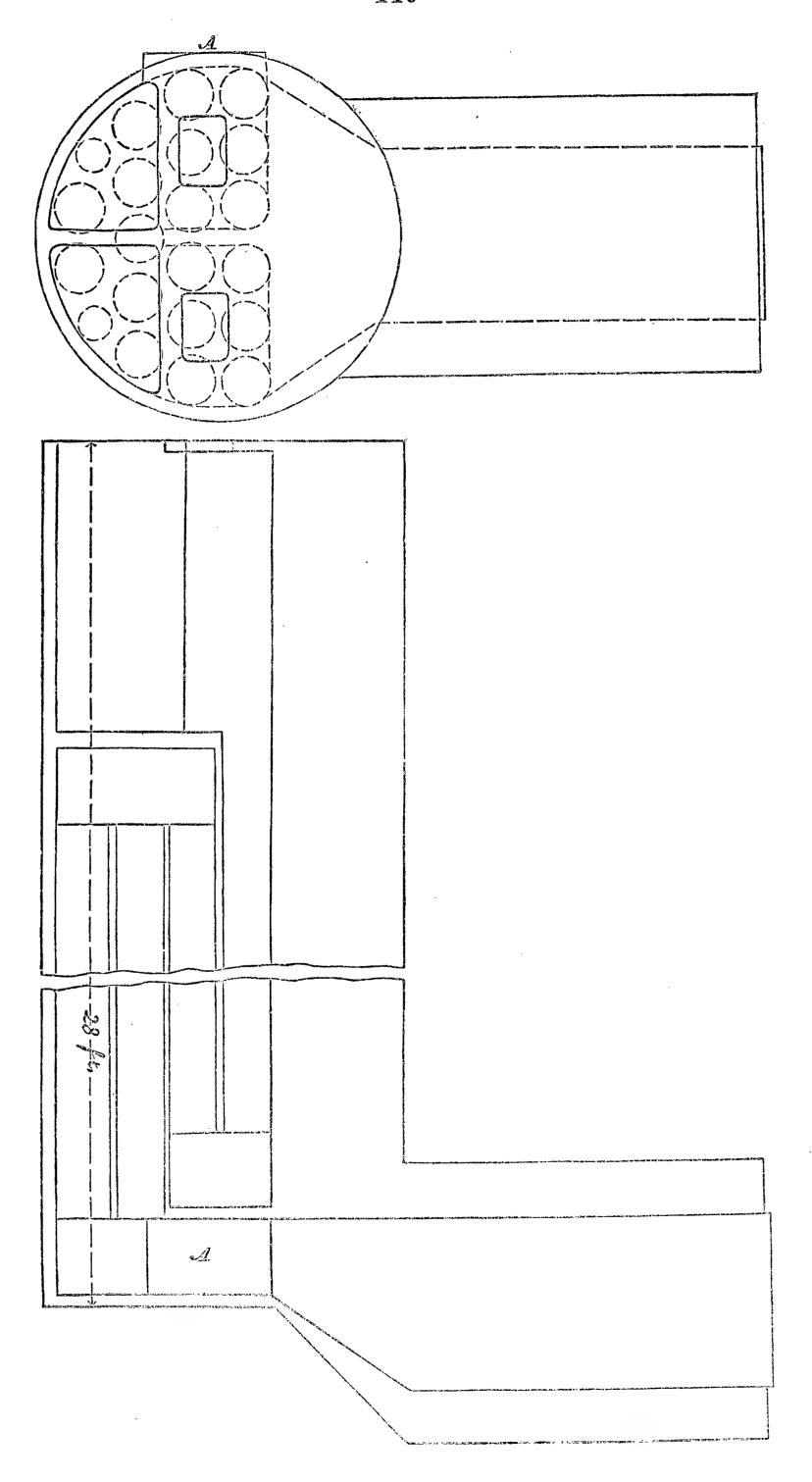
# EMPIRE STATE.

(ON LAKE ERIE.)

Merchant Steamer running from Buffalo to Chicago. Engine designed by Erastus W. Smith, Esq., and constructed by Merrick & Towne, of Philadelphia. Boilers by Merrick & Towne.

initial printer as a second se		Feet.	Inches.
Length on Deck,	٥	310	0
Breadth of Beam,		37	0
Depth of Hold,	•	14	7
Tonnage, .	tons 15	70	
Draft of Water, when light, .	•	7	3
One Beam Engine.			
Diameter of Cylinder,	•	6	4
Length of Stroke,		12	0
Diameter of Paddle Wheels, .	•	38	0
Length of Paddles,		10	0
Depth of "	•	2	6
Number of Paddles in each Wheel,	3.	2	
Dip of Wheel, when light, .		. 3	4
Average Number of Revolutions,	. 16	3	
Average Pressure of Steam, .	lbs. 30	)	
Cutting off at .	•	6	0
Three Iron Boilers, below deck.*			
Whole Amount of Fire Surface,	528	6 squa	re feet.
"Grate"	21	.6	66
Ratio of Fire Surface to cubic foot of Cylinder,	1	4 to	1.
" Grate Surface	2	$4\frac{5}{10}$ to	1.
Area of 1st Flues,	2	$6_{10}^{7}$ sq	uare feet.
" 2d " .		$8_{10}^{2}$	
" 3d "	3	$9\frac{9}{10}$	"
" Chimnies,	3	$9_{10}^{9}$	"
Height of "above Grate,	. 7	5 feet.	
Consumption of Bituminous Coal per hour,	560	0 lbs.	
Water Evaporated by 1 lb. of Coal, .	•	$6rac{1}{2}$ "	
Coal per hour to a square foot of Grate,	. 2	6 "	
			_

<sup>\*</sup>There are two chimnies, one on each side of Boiler; the centre Boiler connecting to the side Boilers by the flue A A.



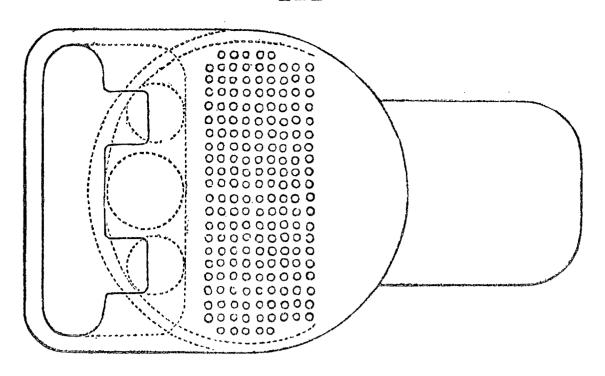
## BUCK EYE STATE.\*

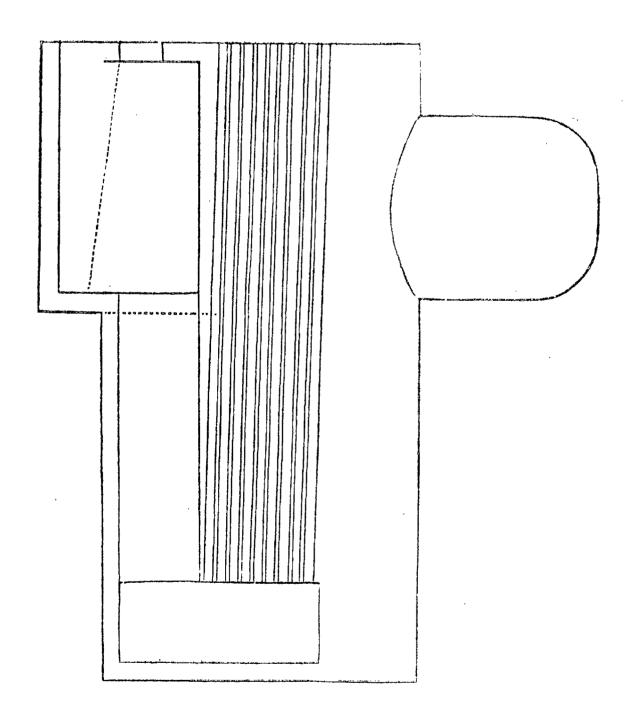
Merchant Steamer on Lake Erie to run from Buffalo to Cleveland. Engine and Boilers designed by Erastus W. Smith, Esq., New York.

					Feet.	Inches.
Length on Deck,	ė		ó		282	0
Breadth of Beam,		ò		ò	32	11
Depth of Hold,	٠		6		13	0
Tonnage, .		ė		tons 11	.87	
Draft of Water,	•		•		<del>) - Carringles</del>	gryder Barbonskier) Da
One Double Cylinder.	Annular	r Beam	Engine	.†		
Diameter of Small Cyl	inder,		0		3	1
" Large	. 6	4		•	. 6	8
Length of Stroke,		6		•	11	0
Diameter of Paddle W	heels,		ò		35	
Length of Paddles,		o		•	9	8
Depth of	•		ó		2	2
Number of Paddles in	each W	Vheel,		٠ و	30	
Average Dip of Wheel	l (estim	ated,)			3	10
Average Number of R	evoluti	ons,		cas	ngingan/mile	
Average Pressure of S	team,		ó		narridhir/7	
Three Iron Boilers (be	low dec	ck).				
Whole Amount of Fire	e Surfac	ce,	ь	805	55 squar	e feet.
" Gra	ate "			15	59	"
Ratio of Fire Surface to	cubic f	ft of Sr	nall Cylii	nder, 10	0 to 1.	
(( ((	Grate	Surfa	ce,	5	$0\frac{1}{2}$ to 1.	•
Area of 1st Flues,		ø		. 2	24 squa	re feet.
"Tubes .			o	$\mathcal{Z}$	28	"
" Chimnies,		Ó			$39\frac{9}{10}$	"
Height of "abo	ve Grate	e,	•	м	75 feet.	
Consumption of Bitum	inous (	Coal po	er hour,	t=		
Water Evaporated by	1 lb. o	f Coal	,	**	2-mora	
Coal per hour to a squ	are foot	t of Gi	rate,	a.	QAMUTTS	

<sup>\*</sup> Not yet finished.

<sup>†</sup> The Steam from the Boiler is used full stroke in the small cylinder, and expanded into the larger.





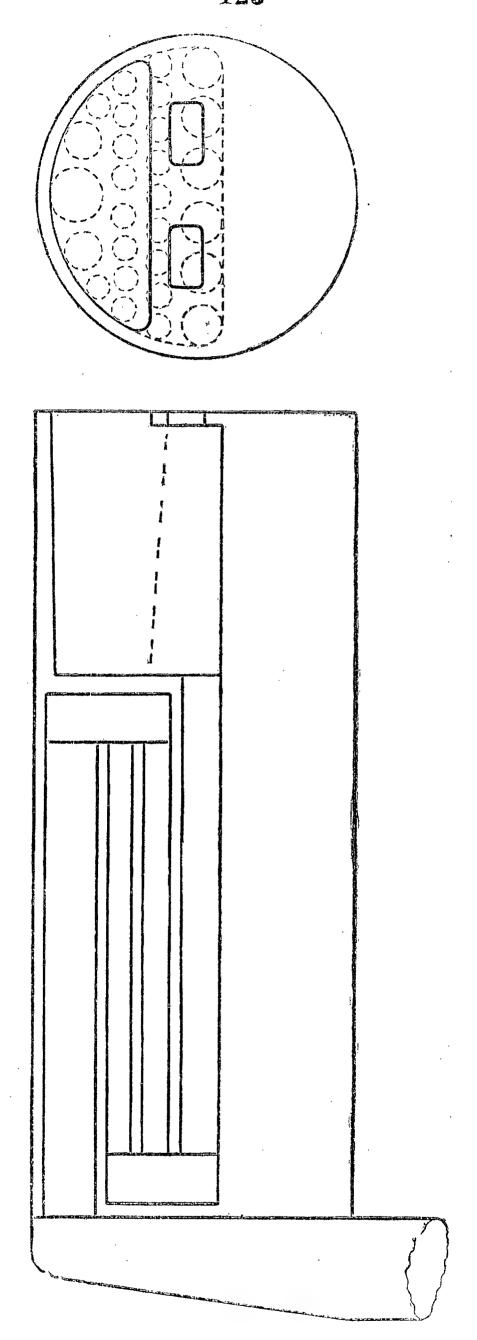
# 122

#### JOHN FITCH.

Ferry Boat on the Hudson River from New York to Hoboken. Engine and Boiler designed and constructed by Hogg & Delamater, New York.

	Feet.	Inches.
Length on Deck,	152	O
Breadth of Beam, .	25	0
Depth of Hold,	11	0
Tonnage, . tons	396	
Draft of Water,	6	O
One Beam Engine.		
Diameter of Cylinder,	3	0
Length of Stroke,	9	0
Diameter of Paddle Wheels,	18	6
Length of Paddles, .	9	0
Depth of "·	2	4
Number of Paddles in each Wheel,	16	
Dip of Wheel,	2	4
Average Number of Revolutions,	22	
"Pressure of Steam, lb	s. 12	
Cutting off at	3	0
One Iron Boiler (below deck).		
Whole Amount of Fire Surface, .	1115 square	e feet.
"Grate".	50	6
Ratio of Fire Surface to cubic foot of Cylinder,	$17\frac{1}{4}$ to 1	•
" Grate Surface,	$22_{10}^3$ to $1$	L.
Area of 1st Flues,	6 square	e feet.
" 2d "	6	"
" 3d "	$4\frac{5}{10}$	"
"Chimney,	$6_{rac{3}{10}}$	"
Height of "above Grate, .	55 feet.	
Consumption of Anthracite Coal per hour,*	Assessment	•
Water Evaporated by 1 lb. of Coal, .	B-ME-PROFFIN	
Coal per hour to a square foot of Grate,	unidaminatio	

<sup>\*</sup> The consumption of coal on this boat is 300 lbs. per hour during the entire day, a considerable portion of which time she is lying in dock. There is no means of telling her consumption while running. The boiler gives an ample supply of steam.

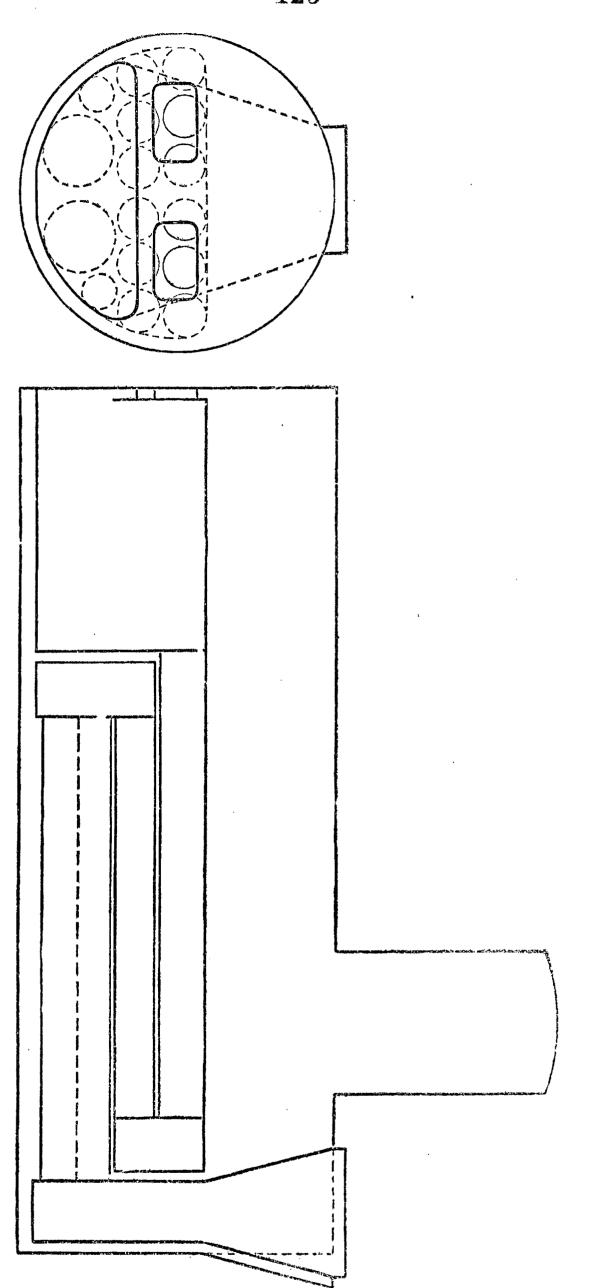


## ONALASKA.

Ferry Boat on the East River from New York to Williamsburg. Engine and Boiler designed and constructed by George Birkbeck, Jr., New York.

		Feet.	Inches.
Length on Deck,	ð	140	0
Breadth of Beam,		32	0
Depth of Hold,	•	9	0
Tonnage, to	ons 330		
Draft of Water,	o	4	6
One Beam Engine.			
Diameter of Cylinder,	Ø 4	3	. 2
Length of Stroke, .		9	0
Diameter of Paddle Wheels, .	ø	19	0
Length of Paddles,		7	0
Depth of "14 ins. each, or	٥	2	4
Number of double Paddles in each wheel,	28		
Dip of Wheel, .	ø	2	4
Average Number of Revolutions .	25		
"Pressure of Steam, "	lbs. 20		
Cutting off at .		4	б
One Iron Boiler (below deck).			
Whole Amount of Fire Surface,	1096	square	feet.
" Grate "	56		6
Ratio of Fire Surface to cubic foot of Cylinder,	15	$\frac{1}{2}$ to 1.	
"Grate Surface,	19	$\frac{1}{10}$ to 1	
Area of 1st Flues, .	7	io squ	are feet.
66 2d 66		1 0	"
" 3d "		′ <u>4</u> 10	66
"Chimney, .		1 0 1 0	46
Height of " above Grate,		feet.	
Consumption of Anthracite Coal per hour,*	<del>W.C. column</del>	ස	
Water Evaporated by 1 lb. of Coal,	- Carret	n	
Coal per hour to a square foot of Grate,	B Ingentura	<b>x</b>	•

<sup>\*</sup> No accurate means of ascertaining consumption of coal, as a considerable portion of time is spent in dock. The boiler gives an ample supply of steam.

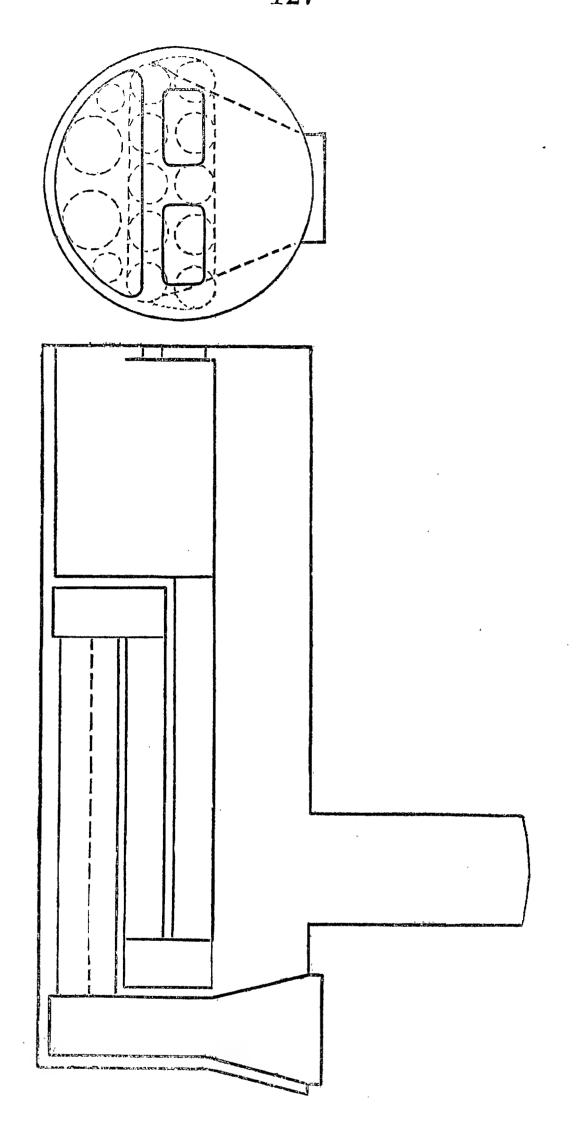


## SENECA.

Ferry Boat on the East River from New York to Williamsburgh. Engine and Boiler designed and constructed by George Birkbeck, Jr., New York.

	Feet.	Inches.
Length on Deck,	120	0
Breadth of Beam,	30	0
Depth of Hold,	8	6
Tonnage, . tons 274		
Draft of Water,	4	3
One Beam Engine.		
Diameter of Cylinder,	2	8
Length of Stroke,	8	0
Diameter of Paddle Wheels,	18	0
Length of Paddles,	6	0
Depth of Paddles, 13 ins. each, or .	2	2
Number of Double Paddles in each Wheel, 18	8	
Dip of Wheel,	2	2
Average Number of Revolutions, 29	5	
Average Pressure of Steam, . lbs. 20	)	
Cutting off at	4	0
One Iron Boiler (below deck).		
Whole Amount of Fire Surface, . 712	square	feet.
"Grate Surface, 36	;	6
Ratio of Fire Surface to cubic foot of Cylinder, 16	6 to 1.	
" Grate Surface, 20	) to 1.	
Area of 1st Flues,	5 square	e feet.
" 2d " .	5 .	• 6
" 3d "	<b>5</b>	: 6
Chimney, .	7	
Height of "	) feet.	
Consumption of Anthracite Coal per hour,*	***	
Water Evaporated by 1 lb. of Coal,		
Coal per hour to a square foot of Grate,	was,	

<sup>\*</sup>No accurate means of obtaining quantity of fuel, for the reason stated in last boat. The boiler gives an ample supply of steam.

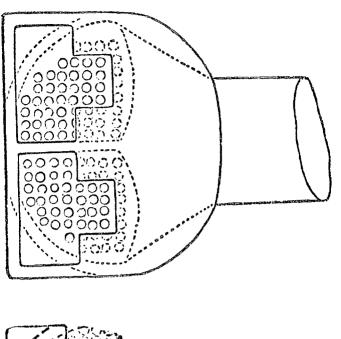


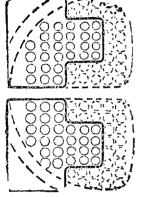
# 128 MERCHANT.

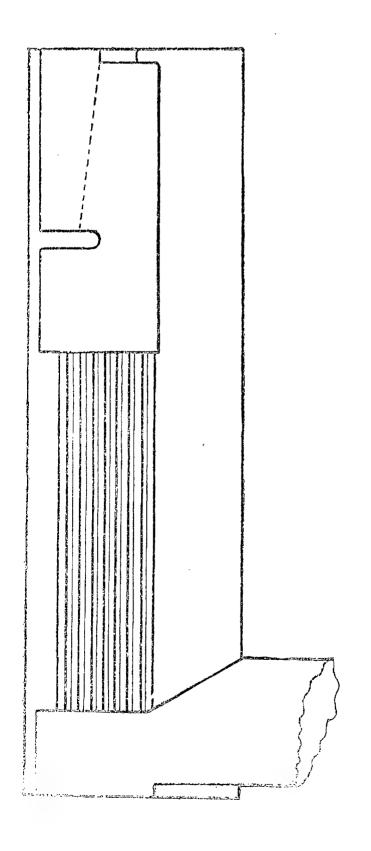
Ferry Boat on the Delaware River from Philadelphia to Camden. Engine and Boiler designed and constructed by I. P. Morris & Co., Philadelphia.

	Feet.	Inches.
Length on Deck,	115	0
Breadth of Beam,	30	0
Depth of Hold,	8	0
Tonnage, . tons ?	245	
Draft of Water,	4	6
One Beam Engine.		
Diameter of Cylinder,	2	6
Length of Stroke,	9	0
Diameter of Paddle Wheels,	16	0
Length of Paddles,	6	0
Depth " "	1	10
Number of Paddles in each Wheel,	14	
Dip of Wheel,	2	0
Average Number of Revolutions, (throttle 1/2 open	a) 25	
	s. 30	
Cutting off at	4	6
One Iron Boiler (below deck).		
Whole Amount of Fire Surface, .	1126 square	e feet.
Grate ".	$29\frac{1}{2}$	6
Ratio of Fire Surface to cubic foot of Cylinder,	$25\frac{1}{2}$ to 1.	
" Grate Surface,	38 to 1.	
Area of Tubes, .	6 square	e fe <b>et.</b>
Chimney, .	10	6
Height of "above Grate,	50 feet.	
Consumption of Anthracite Coal per hour,*	Served Se	
Water Evaporated by 1 lb. of Coal,	Transpired .	
Coal per hour to a square foot of Grate,	-	

<sup>\*</sup> Consumes 4480 lbs. of coal in 14 hours, a portion of which time she is lying in dock. Boiler makes ample steam, and contains 94 3-in. tubes and 10 4-in. tubes.





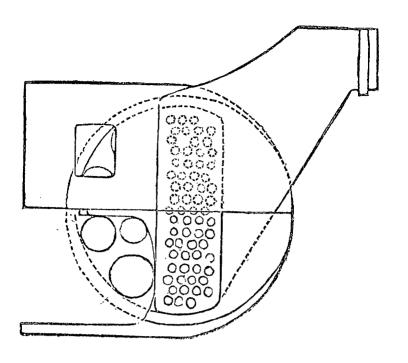


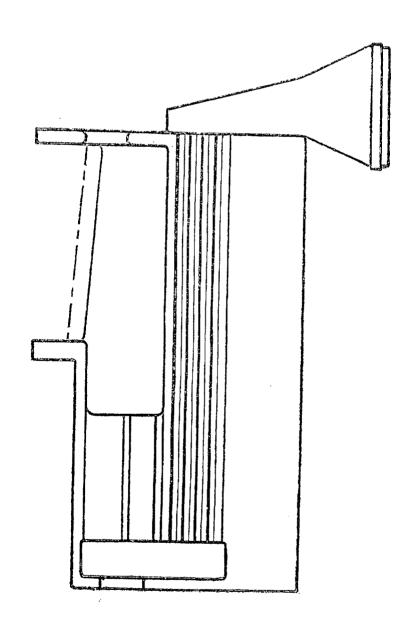
# 130 GORGONA.

Iron Steamer for the Chagres River. Hull, Engines, and Boilers designed and constructed by Mott & Ayres, New York.

	Feet.	Inches.
Length on Deck,	125	0
Breadth of Beam,	22	6
Depth of Hold,	7	0
Tonnage, . tons	184	
Draft of Water,	$oldsymbol{4}$	6
Two Engines (high pressure), slightly inclined.		
Diameter of Cylinders,	1	5
Length of Stroke,	5	0
Diameter of Paddle Wheels,	18	6
Length of Paddles,	7	0
Depth of "·	1	4
Number of Paddles in each Wheel,	18	
Dip of Wheel,	3	6
Average Number of Revolutions, .	18	
Average Pressure of Steam, .	80 lbs.	
Cutting off at .	3	2
Two Iron Boilers (on deck).		
Whole Amount of Fire Surface, .	1664 squar	re feet.
"Grate Surface,	66	66
Ratio of Fire Surface to cubic foot of Cylinder,	106 to 1.	
" Grate Surface, .	25 to 1.	
Area of 1st Flues,	$9\frac{3}{4}$ squ	are feet.
"Tubes,	$6\frac{1}{2}$	66
"Chimney, .	$8_{\frac{3}{10}}$	"
Height of 'above Grate, .	38 feet.	
Consumption of Anthracite Coal per hour,	700 lbs.	
Water Evaporated by 1 lb. of Coal,	$6_{\frac{3}{10}}$ "	
Coal per hour to a square foot of Grate,	$10_{10}^{6}$ "	

<sup>\*</sup> Results from trial trip.





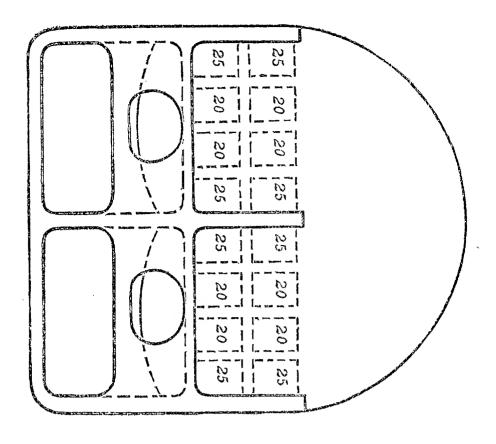
## JOHN NELSON.

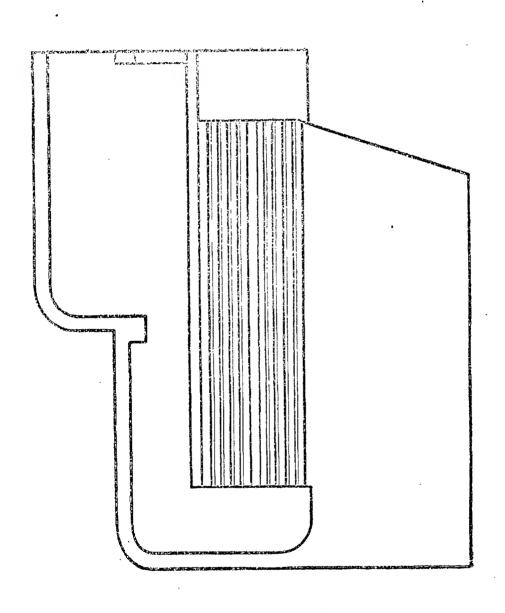
River Steamer running from New York to New Brunswick. Engine and Boilers designed and constructed by H. R. Dunham & Co., New York.

		${f F}$	eet.	Inches.
Length on Deck,	ø	. 2	265	0
Breadth of Beam,			28	0
Depth of Hold,	•		8	6
Tonnage, .	ton	s 621		
Draft of Water,	o		3	0
One Beam Engine.*				
Diameter of Cylinder, .	ø		4	8
Length of Stroke,			12	0
Diameter of Paddle Wheels, .	•		32	0
Length of Paddles,			10	O
Depth of "	•		2	4
Number of Paddles in each Wheel,		32		
Dip of Wheel, when light,			2	6
Average Number of Revolutions,	•	18		
Average Pressure of Steam, .	lb	s. 23	_	
Cutting off at	9		3	6
Two Iron Boilers (below deck).				
Whole Amount of Fire Surface, .		4672	squa	re feet.
"Tube".	•	3768		• •
"Grate".		130		66
Ratio of Fire Surface to cubic foot of Cylinder,	,	$22_{ar{1}}$	$\frac{8}{0}$ to	1.
" Grate Surface		36	to 1.	•
Area of Tubes,		16	squa	re feet.
"Chimney,	•	procession		
Height of "above Grate, .		-		
Consumption of Anthracite Coal per hour,†		2600	lbs.	
Water Evaporated by 1 lb. of Coal, .		6	66	
Coal per hour to a square foot of Grate,	ò	20	66	

<sup>\*</sup> This boat has, in addition to large engine, two engines for forcing air through her bottom to reduce the friction of the water; they have cylinders 14 inches diameter, 4 feet stroke, and make 60 revolutions, cutting off at  $\frac{1}{2}$  stroke; blast cylinders 40 inches diameter, 4 feet stroke.

<sup>†</sup> Fan blast under grate.

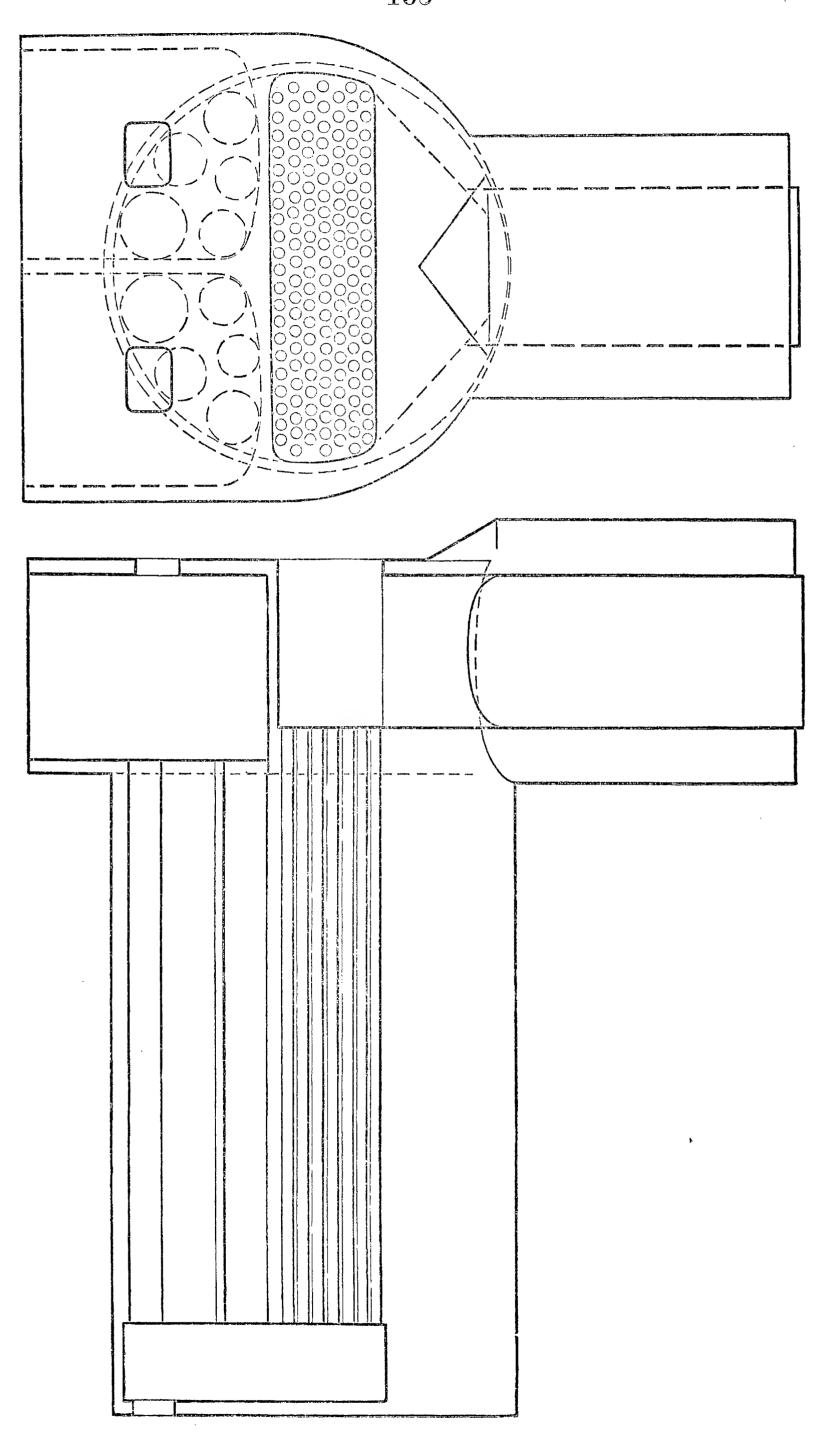




# BALTIMORE.

River Steamer running on the Potomac. Engine and Boiler designed and constructed by Reaney, Neafie, & Co., Philadelphia.

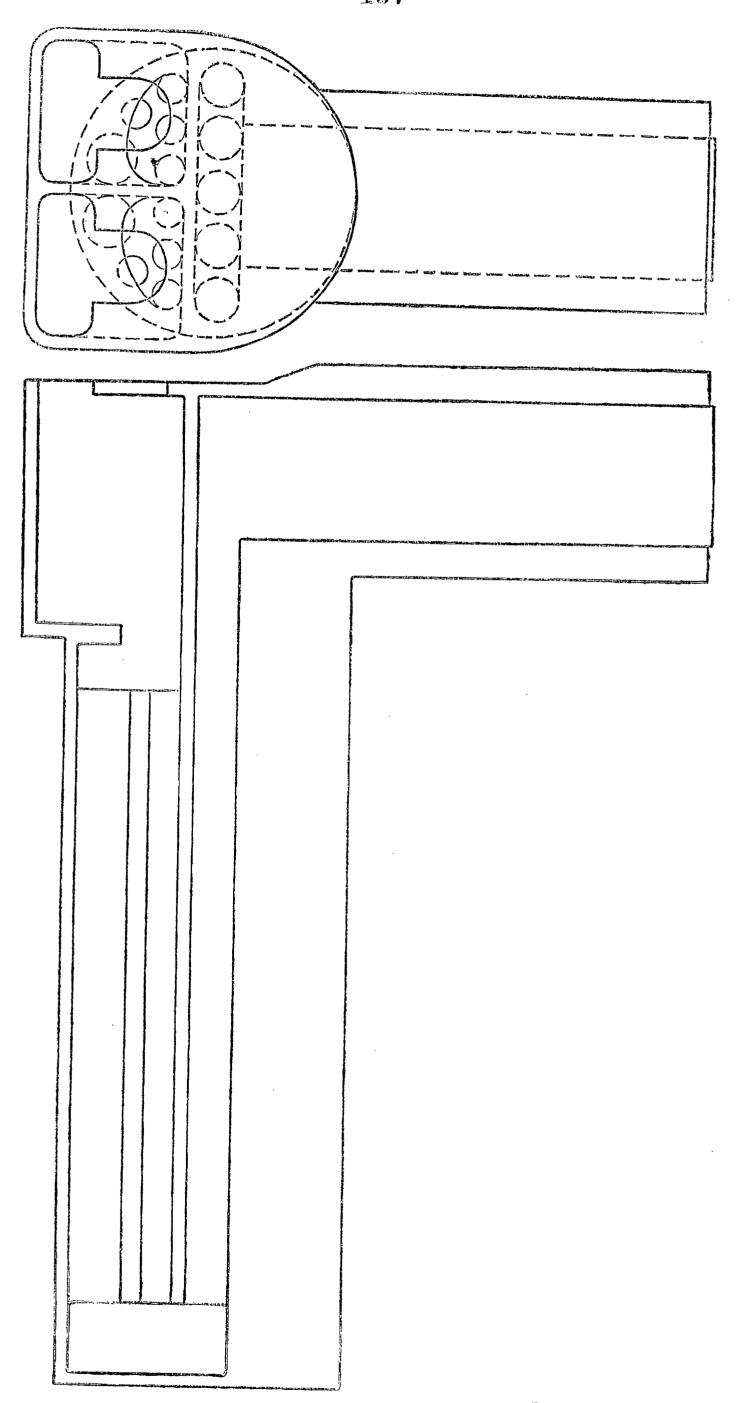
		Feet.	Inches.
Length on Deck, .	0	200	0
Breadth of Beam,	•	27	0
Depth of Hold, .	•	9	0
Tonnage,	tons 4	70	
Draft of Water,		3	6
One Beam Engine.			
Diameter of Cylinder,	•	3	$8\frac{1}{2}$
Length of Stroke, .	•	11	0
Diameter of Paddle Wheels,	•	29	0
Length of Paddles,	•	9	0
Depth of ".	•	2	0
Number of Paddles in each Wheel,	. 29	2	
Dip of Wheel,	0	2	O
Average Number of Revolutions,	2	L	
Average Pressure of Steam,	lbs. 30	)	
Cutting off at,			•
One Iron Boiler (below deck).			
Whole Amount of Fire Surface,	2628	3 square	feet.
"Grate "Grate	60	204	
Ratio of Fire Surface to cubic ft of Small	Cylinder, 22	$\frac{1}{0}$ to 1.	
"Grate Surface,	•	$\frac{3}{3}$ to 1.	
Area of 1st Flues,		$rac{1}{2}$ squar	e feet.
"Tubes".			6
Chimney,		$8\frac{1}{2}$	•
Height of "above Grate,	A.M.Cashiwa	<b>4</b>	
Consumption of Pine Wood per hour,	резичен	<b>~</b> 7	
Water Evaporated by 1 lb. of Wood,	والمعادوان	<b>.</b>	
a desired to the same of the s			



# GENERAL TAYLOR.

River Steamer to run on the Hudson. Boilers and Wheels by John F. Rodman, Esq., New York.

				Feet.	Inches.
Length on Deck,	đ		σ	322	0
Breadth of Beam, .		ø		38	0
Depth of Hold, .	ø		•	10	4
Tonnage, .		. t	tons 1235		
Draft of Water,	•		•	g. Postalements	<del>distriction to</del>
A Rotary Engine of large size	ze was i	ntende	d to have		
been used, the piston m	aking th	e same	e number		
of Revolutions as the pac	-				
a portion has been const					
doned, and at present t	the size	and fo	rm is not		
decided.					
Diameter of Paddle Wheels,	đ		•	40	Q
Length of Paddles, .		ø		11	0
Depth of "	•		•	3	0
Number of Paddles in each V	Vheel,		<b>2</b> 8		
Dip of Wheel, .	•		σ	(contrasted)	No turn Million Chr.
Average Number of Revolution	ons,	•	No.CA ARTISON, MODE		
Average Pressure of Steam,			<b>S</b> peciments		
Cutting off at .	•	٠		Patronia and M	C. of the parties of the last
Four Iron Boilers.					
Whole Amount of Fire Surface	e,	o	5132	square	e feet.
"Grate			208	•	66
Ratio of Fire Surface to cubic	foot of	Cylinde	er, —		
	Surface	•		6 to 1	L.
Area of 1st Flues, .		•		square	
" 2d " .	•		$24\frac{1}{2}$		"
" Chimnies, .		•	$50\frac{1}{2}$	•	66
Height of " above Grate,			el Economical	•	
Consumption of Anthracite Co	oal per h	our,	<b>Characteris</b> American		
Water Evaporated by 1 lb. of	_	•	क्षक्रकराज्ञा		
Coal per hour to a square foot		e,	grammati inte		



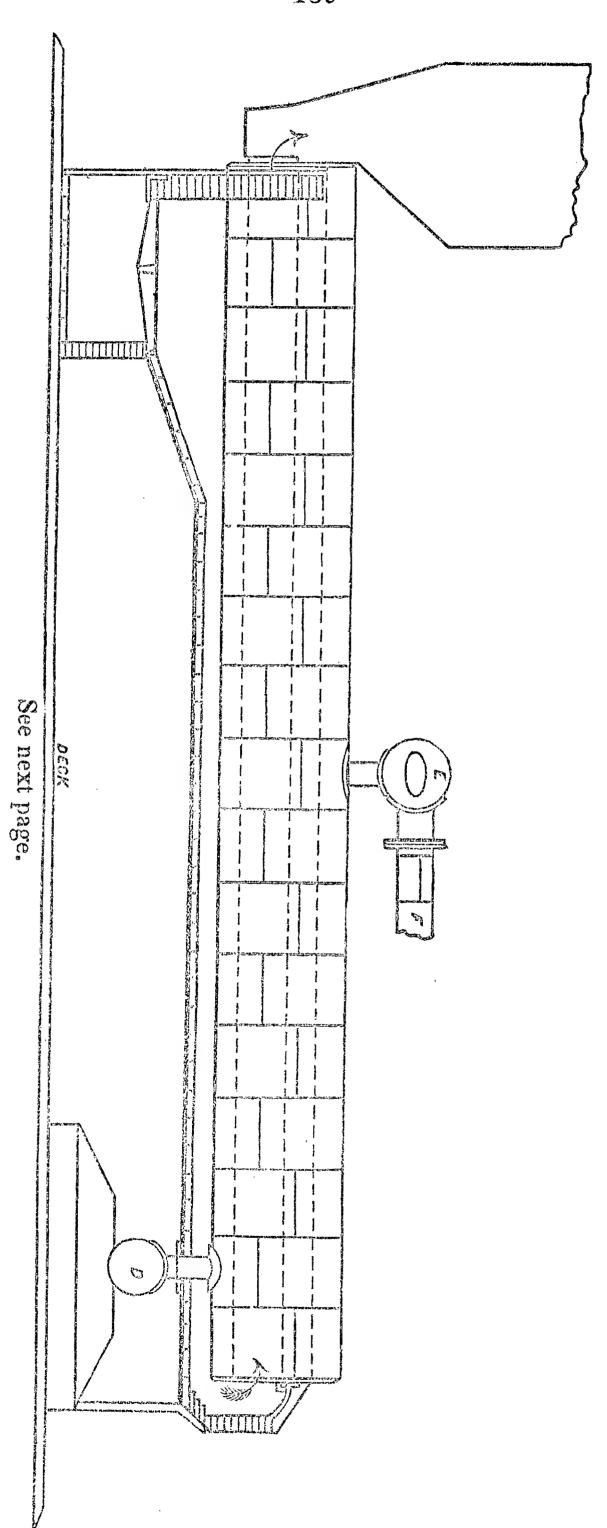
#### 138

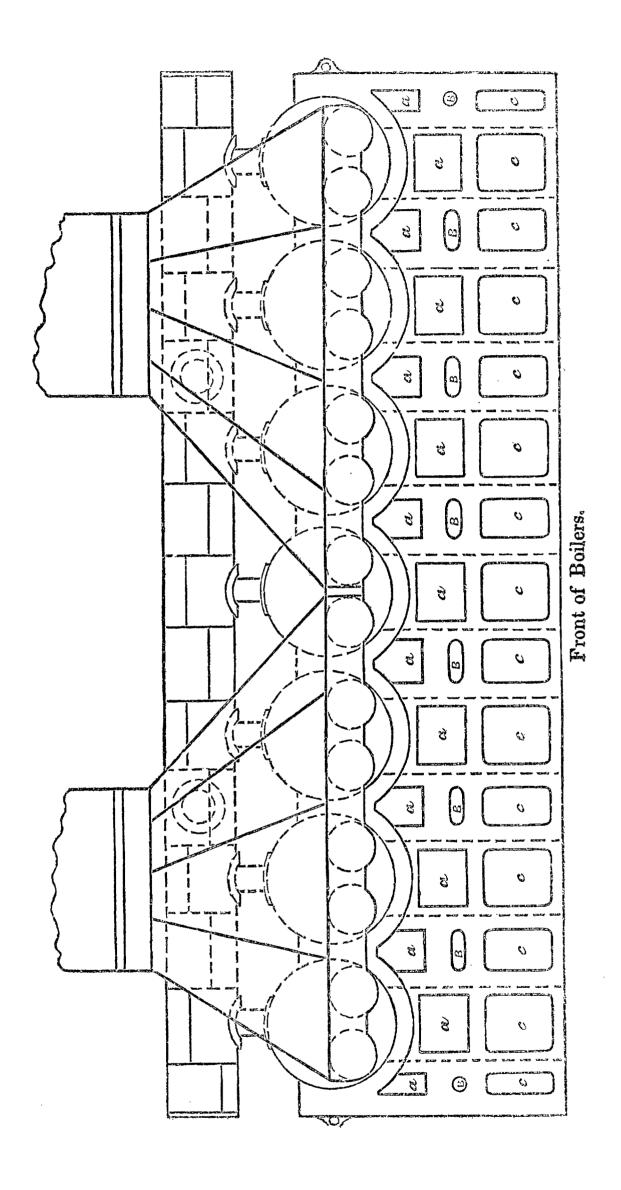
# AMERICA.

#### (ON LAKE ERIE.)

Merchant Steamer running between Buffalo and Chicago. Engines and Boilers designed by S. T. Newhall, Esq., and constructed by Yeatman & Shield, Cincinnati.

	Feet.	Inches.
Length on Deck,	225	0
Breadth of Beam, .	34	0
Depth of Hold,	12	<b>0</b>
Tonnage, . tons	876	
Draft of Water,	8	0
Two High Pressure Engines, slightly inclined.		
Diameter of Cylinders,	2	6
Length of Stroke,	11	O
Diameter of Paddle Wheels,	34	0
Length of Paddles,	10	6
Depth of "· · ·	3	4
Number of Paddles in each Wheel,	24	
Dip of Wheel,	3	O
Average Number of Revolutions, .	17	·
Average Pressure of Steam, .	90 lbs.	
Cutting off at	4	2
Seven Iron Boilers, on deck.		
Whole Amount of Fire Surface, .	3640 squar	
" Grate Surface,	112	66
Ratio of Fire Surface to cubic foot of Cylinder,	$33\frac{3}{4}$ to 1	
" Grate Surface, .	$32\frac{1}{4}$ to 1	•
Area of 1st Flue,	26 squai	
" 2d Flues, .	25	66
" Chimnies,	39	66
Height of "above Grate, .	60 feet.	
Consumption of Bituminous Coal per hour,	4480 lbs.	
Water Evaporated by 1 lb. of Coal, .	410 66	
Coal per hour to a square foot of Grate,	40 "	





#### WESTERN RIVER STEAMERS.

The form of boiler used in the Steamer America, on Lake Erie, and here shown, is the one universally adopted on our western rivers, and will probably continue to be used so long as they remain attached to their present system of high pressure engines. One drawing is a sufficient explanation. Their proportion of boiler may be seen from the following steamer built a few years since; no change of importance has taken place in that time that I am aware of.

#### STEAMER J. M. WHITE.

Length on Deck,		250	0
Breadth of Beam, .	•	31	0
Draft of Water when light, .		5	0
Two Engines, slightly inclined.			
Diameter of Cylinder,		2	6
Length of Stroke, .		10	O
Diameter of Paddle Wheels, .		30	0
Length of Paddles, .	0	14	0
Depth of "·		2	6
Number of Paddles in each Wheel,	9	18	
Seven Iron Boilers on deck.			
Diamater of Boilers,		3	6
Length of ".	•	30	O
Whole Amount of Fire Surface, .		2801 squar	e feet.
"Grate"		108	"
Ratio of Fire Surface to cubic foot of Cylind	der,	30 to 1.	
" Grate Surface		26 to 1.	
Area of Flues, .		17 squar	re feet.
" Chimnies,	•	32	66
·			

## WHICH IS THE BEST BOILER?

Is a question that I have often been asked, and is one that is more easily asked than answered. Of the two ordinary forms of flue boilers I consider the drop flue preferable as occupying less space to produce a given effect. A good comparison may be made between these two forms by examining the boilers of the Bay and Empire State on Long Island Sound; the boats and engines being almost identical. Of tubular boilers there are two varieties, those having vertical, and those with horizontal tubes; so far as efficiency is concerned I do not think any difference would be observed where equal surface was presented to the action of the fire. Those with horizontal tubes take up less space in the length of the vessel, but more height than those having vertical tubes, unless the latter are made sufficiently high to withdraw a tube within the boiler, when its height would be as great as the former. The Miller boiler, recently brought forward by the Novelty Works in New York, has some advantages over the ordinary form of flue boilers, as it allows of increased grate and fire surface within a given space, and is somewhat lighter than the ordinary flue boiler for the same amount of fire surface.

I am of opinion that equal efficiency may be obtained with either of the forms of boiler (properly constructed) here shown; but there are many things, particularly in sea steamers, to be considered, and for them that boiler is the best which, giving equal effect, occupies the least space, always keeping in view the facilities for cleaning and repairs, two points that have been very much overlooked among us. There is one point to which I wish to draw particular attention, and that is the necessity of having an increased number of furnaces of reduced width in our boilers, and continuing the separation to the chimney if possible. advantages to be derived from this arrangement are increased surface in immediate contact with the fire, and a very much more regular supply of steam, for it is evident that where a boiler has but two furnaces, nearly one-half of its efficiency is destroyed while our furnaces are being fired, and of course the pressure of steam is immediately reduced, and as one evil often begets another, so this has induced the use of blowers on the principle that two wrongs make one right, I suppose, for that is the only one on which it can be advocated. Sea steamers should never use blowers; when they are really necessary their boilers are defective. remarks apply with equal force, so far as number of furnaces are concerned, to river steamers, but with them the increased weight of the boiler to obtain sufficient steam by natural draft would often exceed the extra quantity of coal consumed on the passage, (which occupies but a few hours,) and as speed is the primary object, the blower may be as much to be desired with them, as it is to be avoided in the former.

#### NOTE.

The quantity of water stated to have been evaporated by a given quantity of fuel, must not be taken as strictly correct; but where a comparison is to be made between two steamers of the same class, it will be found sufficiently accurate for all practical purposes, in obtaining information in relation to the consumption of steam and fuel. I found that nothing authentic could be ascertained in regard to the quantity of water blown out in marine steamers, and I have, therefore, not considered the losses from that source, or the steam lost in valve chests and at each end of the cylinder. On the other hand, it was just as impossible to obtain the pressure of steam on the piston, from want of indicators, and I was unwilling to adopt any imaginary rule for pressure, as that which would apply to sea steamers, running with throttle valves full open, would not apply to our river boats, where they are more or less throttled off, to maintain a full working pressure in the boiler. I have, therefore, taken the pressure as being the same both in the boiler and on the piston, and the quantity of steam used as being equal to the area of the piston multiplied by the length of stroke at which the steam was cut off, and the number of revolutions. As the management of our river, lake, and sea steamers differs as regards each other, but agrees in respect to each vessel of the same class, so the calculations of fuel here given will be found sufficiently accurate to compare one river steamer with another, or one sea steamer with another, but if a comparison is to be made between a river and a sea steamer, then an allowance must be made in favor of the latter, for the water blown out.

B. H. B.

